

AVIATION WEEK

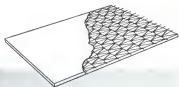
A MCGRAW-HILL PUBLICATION

JULY 19, 1954

50 CENTS

Presenting **3** Fabulous New Materials

HOW MANY WAYS CAN YOU USE THEM?



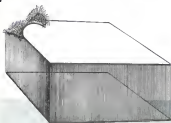
1 A FABRIC THAT CAN "BREAK" and still retain its rated strength!

We call it "Double Break" Fabric. This unique new rubberized material contains "shock threads" which snap upon absorbing a predetermined load — arresting damage — leaving base fabric unruptured and unimpaired. **IDEAL FOR APPLICATIONS CALLING FOR GREAT SHOCK- AND ENERGY-ABSORPTION, INCREASED SAFETY FACTOR.**



2 A FABRIC THAT CAN WITHSTAND a ton per inch!

This special high tensile fabric can withstand more than 2,000 pounds of tension per inch — *a ton to an inch* — can be coated with any desired material. **FOR APPLICATIONS CALLING FOR A FLEXIBLE MATERIAL OF EXTREME STRENGTH.**



3 AN INFLATABLE FABRIC that makes like a beam!

This "Flat Air" Mat is an inflatable structural material with double walls of a new rubber-coated Nylon material connected by thousands of rugged Nylon "hairs". Capable of containing high pressures, can be used for building complete, inflatable structures — including beams believed to be of highest strength-to-weight ratio known. Has excellent thermo- and vibration-insulating qualities. Weighs only 2 lbs. per sq. yd. Ideal for scaffolding, shock cushioning. **FOR LIGHT-WEIGHT — PORTABLE — COLLAPSIBLE STRUCTURES.**

Now available to designers and manufacturers for commercial use. For complete information, write or wire: Goodyear, Aviation Products Division, Department S-1715, Akron 16, Ohio or Los Angeles 54, Calif.



FACILITIES + ABILITIES = EXTRA *plus* IN

ZENITH skill produces
world's largest radomes
for Lockheed "Sentinels
of the Air"



The huge radomes above and below the Lockheed Super-Castellation, and the novel anti-icing radomes contained with electronics, of Zenith's specialized technique and skill in reinforced plastics contained with electronics. These are the giant radomes which provide 240 degree "eyes and ears" for the U. S. Navy and Air Force, scouting far beyond the horizon of the United States for early warning of enemy attack. Zenith's unique background of experience in this highly specialized field is available on contact with Engineering Department—

ZENITH AIRCRAFT **Z** **garden, calif.**
 Division of Zenith Radio Co.

WHAT'S NEW AT BRISTOL...



Need a rugged chopper-inverter? See Bristol's Syncroverter Switch*

Excitation Syncroverter Switches are non-saturating, wide-frequency, low noise-level, precision synchronous inverters or rectifiers, with two EPDT or one EPDT switching action.

A series of models is available, designed for optimum service under various operating conditions involving ambient temperatures of -55° to $+100^{\circ}$ C. and severe conditions of vibration and shock up to 500 g's and up to 5000 Standard contact radius 8 to 12 mils. 2 ma. maximum load. Voltages up to 150 v. can be handled under certain conditions.

EXCITATION REQUIREMENTS: 0.5 va or less with a-c up to 500 cycles. The Syncroverter will operate normally under any wave, square wave, pulse, or special wave shape custom control, also applicable to pulse circuit operation.

FREQUENCY: Operated on ac of fixed or variable frequency; response up to 2000 cycles.

COIL DATA: Available with various coil impedances; also single or double coils for polarizing applications.

SERVICE LIFE: Life is dependent on operating frequency and loading. Typical rating: 1000 hours at 400 cycles.

Refined Syncroverter Switches are available with either "make-before-break" or "break-before-make" switching action. They are reliable in the microvolt and millivolt ranges. Coils are hermetically sealed.

If you have an application requiring a high-quality synchronous rectifier or inverter, write to The Bristol Company, 150 Bristol Rd., Waterbury 20, Conn., outlining your requirements. We can help you.

*Trade Mark



OSCILLOGRAPH PATTERNS photographed during EPDT switching of a Bristol Syncroverter at various frequencies in circuit shown.



CIRCUIT of Syncroverter and Oscilloscope during the above test.



BRISTOL

FINE PRECISION INSTRUMENTS
 FOR OVER 50 YEARS



MORE ACCURATE FIRE CONTROL UNDER ALL FLIGHT CONDITIONS

Actual flight tests have shown that TDP sights of attack and defense instruments have substantially increased fire control accuracy under all flight conditions. That is why they are standard equipment on many of the world's fastest aircraft. In other systems where angle of attack and altitude information is required, such as heading approach control, fuel economy control, cruise control, climb control and climb warning, TDP units substantially justify themselves and prove performance. In addition to military applications, TDP instruments offer various possibilities in improving the performance and lowering the operating costs of commercial planes.

TDP engineering facilities solve your electronic control problems in both air craft and missile flight systems. Their outstanding record of dependable performance and production ensures your service satisfaction. Write or wire for literature.



INDUSTRIES, INC.

1001 West 126th St., Los Angeles 41, Calif.

Aviation Week

JULY 15, 1954

VOL. 61, No. 3

Editorial Office

New York 16—328 W. 42nd St., Phone LOngmead 4-3880 (Night LO 4-3822)
Washington 4, D. C.—1001 Penn. Bldg., Phone NAtion 5-3314
Los Angeles 13—1111 Wilshire Bldg., Phone MAInen 6-4233

Table of Contents on Page 8

\$1, 75¢ copies of this issue postpaid

Robert W. Martin, Jr.

Publisher

Robert H. Wood

Editor

Robert E. Hottel, Executive Editor

Albert W. Bantz

News Editor

Ernest J. Bolen

Special Assignments

David A. Anderson

Engineering

William J. Conklin

West Coast

Frank Stone

Business

Beverly Long

West Coast Assistant

C. L. Chiswick

Equipment, Maintenance

Henry Leber

News Desk

Katherine Johnson

Congress

Charles C. Conley

News Desk

Philip Klus

Aviation

G. J. McElroy

Washington News Desk

Claude G. Wenz

Aviation

Lawrence J. Herb

Art Editor

Richard Belmont

Transport

Victoria Connors

Editorial Missions

Frank Shea, Jr.

Transport

Les T. Terpey

Printing & Production

Merle H. Michel, Administrative Assistant to the Editor

FOREIGN NEWS BUREAUS

Atlanta 8

361 Rhodes-Henry Bldg.

Boston 25

1307 Federal Bldg.

Chicago 14

129 No. Michigan Ave.

Los Angeles 37

1111 Wilshire Bldg.

Cleveland 19

1918 Huron Bldg.

San Francisco 6

68 Post St.

Detroit 35

156 Freedom Bldg.

Washington 4

1219 Marston Park Bldg.

FOREIGN NEWS SERVICE

Editor

Joseph K. Van Denburg, Jr.

Merle

Harriet Lippold

London

Edward W. S. Hall

Mexico City

John Watkins

Paris

John O. Cappock

Sao Paulo

Samuel J. Holmes

Rome

Gerald W. Schaefer

Tokyo

Nippon W. Perry

Aviation Week is served by Paine Associates, Inc., a subsidiary of Associated Press

Research and Marketing: Mary Dettlor Smith, Mary Whitney and Jeanne Salesmark

J. G. Johnson

Business Manager

T. B. Olson, Production Manager

W. V. Coker, Production Manager

Sole Representatives: J. G. Anthony, New York; H. F. Johnson, Cleveland; D. T. Davis and J. S. Costello, Chicago and St. Louis; E. P. Elward, St. Boston; James Cady, Dallas; William D. Lewis, Jr., Atlanta; R. E. Dethard, San Francisco; C. F. McDonald and Gordon Jones, Los Angeles; W. F. Henry, Philadelphia; C. A. Kordell, Detroit. Other sales offices in Pittsburgh, London.



AVIATION WEEK • JULY 15, 1954 • \$1.00, No. 3
Master AEP and AEC



Published weekly by AVIATION WEEK COMPANY, Inc., 3201 North Broadway, Atlanta 17, Ga. (Phone: 526-1111). Second-class postage paid at New York, N.Y., and at additional mailing offices. Postmaster: Send address changes in New York City to AVIATION WEEK, 3201 North Broadway, Atlanta 17, Ga. Outside New York City to AVIATION WEEK, 1001 Penn. Bldg., Washington 4, D.C. (Phone: NA 5-3314). Single copies 15¢. Subscriptions: \$3.00 per year in advance. Foreign subscriptions: \$5.00 per year. Payment in advance. No refunds. Second-class postage paid at New York, N.Y., and at additional mailing offices. Postmaster: Send address changes in New York City to AVIATION WEEK, 3201 North Broadway, Atlanta 17, Ga. Outside New York City to AVIATION WEEK, 1001 Penn. Bldg., Washington 4, D.C. (Phone: NA 5-3314). Single copies 15¢. Subscriptions: \$3.00 per year in advance. Foreign subscriptions: \$5.00 per year. Payment in advance. No refunds.

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD

It takes all Three to make a Guided Missile



BRAIN

The Guidance Mechanism—a highly complex electro-mechanical unit that operates independent of ground control while automatically guiding the missile to its target.

FRAME

The Airframe—the body and external surfaces craft withstand gross stresses and violent temperature changes encountered in supersonic flight at miles-high altitudes.

MUSCLE

The Power Plant—a super-efficient, liquid fuel rocket engine producing immense thrust—power enough to propel the missile at speeds several times that of sound.

Only North American Aviation leads in all three phases of long-range guided missile development. That unique capability enables North American to conceive, design and produce complete guided missiles... from the "ground up." North American's guided missile program, drawing on the experience of 4800 skilled engi-

neers and scientists... aided by the most advanced research facilities... gives our progress in missile development for national defense.

Engineers: North American offers unusual opportunities to qualified engineers seeking a challenging future. Please write: Engineering Personnel Office, Los Angeles 45 or Downey, California, or Columbus, Ohio.

organization, facilities and experience keep

North American Aviation, Inc.

years ahead in aircraft... atomic energy... electronics... guided missiles... research and development.





Watson, California plant of Johns-Manville, where colored facilities are now available to accommodate Thermoflex Blanket and other J-M high temperature insulations for the aviation industry.

Johns-Manville expands production to make Thermoflex Insulating blankets

Enlarged facilities plus J-M insulation engineering service teamed to solve Aviation Industry's internal insulation problems



Problems inherent in your specifications. Thermoflex Blankets serve as insulation for jet pipes, engine cases, turbine casings and other assemblies. These Manville insulations encompass including, by weight and low thermal conductivity.



Backed by the World's largest Insulation Laboratory—located at the J.M. Research Center, Manville, New Jersey. Both test and Watson manufacturing facilities are coordinated with the design and technical services of this laboratory, to solve your thermal or insulation engineering problems.

*Thermoflex is a Johns-Manville registered trademark.

Johns-Manville PRODUCTS FOR THE AVIATION INDUSTRY

Handley Page Victor Crashes, Explodes

Britain's newest long Handley Page Victor crashed at an airfield near Gatwick, England, last week and exploded, killing its four-man crew.

Observers said the crash probably will give Avon Victor a warning edge in the race for the Royal Air Force contract for modern jet bomber production.

Domestic

House (John article) blasted off from its self-proclaimed launch at Ft. Bragg, N. C., last week in the first public showing of Avon's three-ton operational utility aircraft, designed to carry a rocket warhead (AVIATION WEEK, Apr. 5, p. 12).

Pilot strike against Lockheed Avon was called off last week 14 weeks before the rollout was scheduled to start. In a telephone conference with the National Association of Aircraft Manufacturers, and Air Line Pilots Assn. agreed to a non-strike contract that would give them a wage increase retroactive to Feb. 1 and effective until Sept. 1, 1955.

Initiation site of the Air Force Academy is expected to be Lamar AFB, Denver, until the \$126 million USAF "test school" is completed at Colorado Springs.

President Eisenhower's Lockheed Super Constellation is scheduled for its first test flight.

Crew chiefs will be held by Civil Aeronautics Board in Columbia, Ohio, July 27 to determine the cause of a night collision between an American Airlines Constellation and a Navy Beech (JBR) near Fort Belvoir August 10-27 (AVIATION WEEK, July 5, p. 7).

New solid rocket propellant will be produced at a pilot plant to be built and operated by Standard Oil Co. for Air Research and Development Center's Wright Air Development Center.

P. Oswald Milton, assistant New York leader, USAF contracting official and consultant since 1952 has been appointed Deputy Assistant Secretary of the Air Force for Contract Financing. He succeeds Chester D. Sutherland, who resigned last February.

A Research Manufacturing Co. will build cabin air conditioning and pressurization systems for the first two



Boeing Rolls Out Transport for First Flight

Scheduled to make its first flight last week, here is the new Boeing 707 jet transport. The aircraft is the company's first, which, plus following order of mass change without during launch, gave Boeing a solid test (AVIATION WEEK, May 11, p. 16). Avon's plans for the first Boeing 707's 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Boeing SE 10 Constellation, new French jet transport.

Aircraft workers strike has caused Pacific Northwest's Camp to shut down its engine overhaul facility at Lakewood, N. J., but the company says all other activities in its Eastern Division will continue. The rollout was delayed June 19 by United Auto Workers (UAW).

Fifty C-47s have been returned by Great Britain to the U.S. Air Force.

Charles S. Davis, 77, board chairman and former president of Ray-Water Corp., died last month in Peru.

Financial

California Eastern Airlines reports a net operating loss of \$537,730, offset by a net gain of \$572,006 from equipment sales. This compared with a net income of \$230,183 for 1952. Operating income totaled \$11,085,322, a slight increase over the previous year's \$10,675,740.

International

World's speed record of 687.05 mph, set May 6 in Capt. A. E. Sutherland's a Lockheed 1049 over a 241 mi closed course course, has been confirmed officially by the Fédération Aéronautique Internationale, the Royal Swedish Air

Force reports. Waterford topped the 500 mph mark, set by Jacqueline Cochran on a P-80C (AVIATION WEEK, May 17, p. 7).

First jet basic trainer, Hunting Provost's new P-84 jet Provost, has been placed in initial test flight. The new British plane is powered by an Armstrong Siddeley multiplier Victor and developed from Provost Mk. 1-RAF's standard basic trainer.

De Havilland Aircraft of Canada's initial order for 35 Doves \$21.5 for the Royal Canadian Navy is expected to be received between 100 and 210 by the company's request from other North Atlantic Treaty Organization countries.

Transport helicopters as large as the biggest fixed-wing aircraft now flying are to be built by the U.S. designers in response to the request of British Aircraft Corporation.

Boeing-Pratt & Whitney, high-speed transport powered by two Avon engines, will be purchased by the Royal Swedish Air Force under an agreement signed with the British company. Deliveries will begin this fall.

Former Mustang 3, now French-built, was made its first flight.

WHEN YOU
NEED THESE

BIG 12*

"FEATURES-OF-
RESISTANCE" IN

fhp
fractional horsepower

**AIRCRAFT AND
MISILE MOTORS**
(AC or DC)

- * HIGH ALTITUDE
- * LOW TEMPERATURE
- * HIGH TEMPERATURE
- * HUMIDITY
- * FUMIGOS
- * SALT SPRAY
- * VIBRATION
- * ACCELERATION
- * FUEL IMERSION
- * PLUGGING
- * OVERTHEATING
- * SHOCK

call for the assistance of
our electrical laboratory
and research engineers

In the aircraft
with for use over the faster rising
which data units, with and without
battery and motor drives, that are
ready for immediate production!

ELECTRO-AIRE

6000 Paradise Avenue
St. Helens, Calif.

A subsidiary of Electro-Aire, Inc.

The Aviation Week

July 19, 1954

Headline News

French Fly Old Plane in Two Bit War	13
QAGS Rejoin Aerospace Program	14
ASAC to Build Eastern Test Stand	15
Lockheed Climb on OSO-1 Proposal	16
Comet Verdict?	16
NAC Issues A-1 Strike Zero Hour	17
Defense Forces Join Soviet Group	18
ALM Admits Launch Increase	19
ATA Issues Board on Rate Cuts	19
Defense Forces Join Soviet Group	20
Twelve Day Mission	20
Washington Airport This Week	20
CIA to Run AF Policy Center	21
Team Special Extension Scenario	22
Civil Aeronautics Board	23

Aeronautical Engineering

Engineers, NACA Test Stand	24
Thrustmaster Model and Control System	25
V-2 Plans Up to Speed	26

Production

Top Gunner Ultimate Inspector	27
-------------------------------	----

New Aviation Products

Template Speed Angle Gearing	28
Portable Power for Portable Tools	29
Letter Shop Holds Two Dimensions	30

Aviation Safety

CAR Says Turbulence Devoted DC-4	31
----------------------------------	----

Air Transport

Aircraft Engines Revived by Boeing	32
Boeing Flyer	33
Pan Am on Service	34
Teddy Bear Based on Conditions	35
Copier Airline Cost Not Near	36

Editorial

Self, Self, Self	37
------------------	----

Departments

News Digest	38
Feature Page	39
Industry Observer	40
What's Where	41
Production Incident	42
Also on the Market	43
News Highlights	44
Aviation Calendar	45

Picture Credits

—AP/Wide World	46
—AP/Wide World	47
—AP/Wide World	48
—AP/Wide World	49
—AP/Wide World	50
—AP/Wide World	51
—AP/Wide World	52
—AP/Wide World	53
—AP/Wide World	54
—AP/Wide World	55
—AP/Wide World	56
—AP/Wide World	57
—AP/Wide World	58
—AP/Wide World	59
—AP/Wide World	60
—AP/Wide World	61
—AP/Wide World	62
—AP/Wide World	63
—AP/Wide World	64
—AP/Wide World	65
—AP/Wide World	66
—AP/Wide World	67
—AP/Wide World	68
—AP/Wide World	69
—AP/Wide World	70
—AP/Wide World	71
—AP/Wide World	72
—AP/Wide World	73
—AP/Wide World	74
—AP/Wide World	75
—AP/Wide World	76
—AP/Wide World	77
—AP/Wide World	78
—AP/Wide World	79
—AP/Wide World	80
—AP/Wide World	81
—AP/Wide World	82
—AP/Wide World	83
—AP/Wide World	84
—AP/Wide World	85
—AP/Wide World	86
—AP/Wide World	87
—AP/Wide World	88
—AP/Wide World	89
—AP/Wide World	90
—AP/Wide World	91
—AP/Wide World	92
—AP/Wide World	93
—AP/Wide World	94
—AP/Wide World	95
—AP/Wide World	96
—AP/Wide World	97
—AP/Wide World	98
—AP/Wide World	99
—AP/Wide World	100

have
you heard
this one



about
**TURBINE
WHEEL
BROACHING ?**

Here's no instance
where LAPOINTE
engineering reached
in the range of
time and money,
method and machine,
because of uncom-
pensable stress

TWO TURBINE WHEELS
with different diameters, with 4 broach
and 4 broach "dive" cuts, were
BROACHED WITH THE SAME BROACH!

50 YEARS IN BROACHING

We're the oldest in the world.

1902 • 1952 ANNIVERSARY • 1954

Broach, Bore, Drill, Reamer, Tap and
Forming Machines, Tools and Fix-
tures that will help in eliminate pre-
cision broaching in your plant.

LAPOINTE

MACHINE TOOL COMPANY

MAISON, MASS. U.S.A.

WE BUILT 2000 AIR CRAFT AND AIRCRAFT
COMPONENTS, ENGINES AND ACCESSORIES



ALIGHT FOR THE FIRST TIME gave the
new Douglas X-45 jet aircraft
highlighted Navy leader (above and left)
initial flight from Edwards AFB, Calif.
lasted 45 min. It took place June 17, only
two weeks after rollout by the company's
El Segundo Division (Aviation Week June
14, p. 14). Capable of carrying 4,000 lb.
payload or other weapons, the X-45
weighs about 27 ft. and is designed to
carry the U.S. Navy's new 7.5 in. rocket
launcher.

Douglas Tests New Jets for Navy and Air Force

ANOTHER DOUGLAS FIRST FLIGHT was carried out June 17, this time by Long Beach Division, which sent its RB-66A test jet
animator leader for USAF Tactical Air Command (left) (Aviation Week July 5, p. 7). It has two 7,500 lb. thrust Allison T57-A-9s.



INDUSTRY OBSERVER

►USAF will evaluate five competitive lightweight fighter proposals next month with a view toward future procurement plans. Competition in addition to the Lockheed XP-104 includes the Northrop F-16, North American P-38 and a Republic proposal.

►USAF now is having its helicopter blades as part of a complete helicopter package from the prime contractor under the weapon system procurement plan rather than as CDAF purchased directly from a subcontractor. USAF switch was made some time ago as a result of its trend towards weapon system development and not from any specific experience with blade suppliers.

►Bell HSL anti-submarine warfare helicopter is in the midst of serious night refueling program required by Navy for performance of its tactical mission. Navy has added B-3 to F-100s Division to provide a solution to the overnight problem in 90 days.

►USAF now is breaking up the two Convair YB-60 eight-jet bombers for wing metal at Carroll AFB, Tex. The two remaining jet modifications of the B-60 were built at a cost of \$14 million.

►Defense Department has outlined its policy on disposition of weapons facilities owned by contractors of research in registered contract pricing. Instruction number is DOD 14, dated July 1, 1954. Only changes are minor technicalities.

►Strategic Air Command has grounded its two wings of B-44s following a crash in Kansas City, Kan., earlier this month. SAC grounding order does not affect B-44s in other commands. Crash cause is being investigated.

►McDonnell 1311N Duxon is being again after being grounded by the Navy for about 34 months following three crashes (Aviation Week Mar. 25, p. 11).

►Second model of the Bell X-2 supersonic, stainless steel research aircraft has had its Curtiss-Wright 12,000-hp thrust rocket engine installed and is being readied for aerial flight testing at Bell's Wheatfield, N. Y., plant. First X-2 was lost in a rocket explosion while being carried in the belly of a B-29 mother plane.

►Wright Air Development Center propeller lab has active projects on helicopter vibration problems, on wing of helicopter rotor blades and quality control of blade production.

►French Vautin axial-flow turbojet successfully has completed a 15-hr test stand run at full static thrust rating of 12,500 lb. The Vautin, developed by SNECMA, weighs about 3,100 lb. dry without accessories and tailpipe.

►Pitt & Watson, Australia J57 turbojet is being considered for two new installations—one a long-range guided missile and the other a new high speed attack jet bomber.

►If the Strathearn-Packard merger is approved, the new company plans to devote its activities by acquiring firms in the aviation and electronics fields. Company officials already have held exploratory talks with at least one aviation manufacturer.

►Reflexion, Ltd., has hired two nuclear power experts from Harwell, British atomic energy center.

►It is doubtful that Air Navigation Development Board's special committee set up to resolve the controversy between civil VOR/DME and military Tacan will complete its evaluation in time to meet the original July 15 deadline for its report (Aviation Week Apr. 5, p. 87). Group is making a comprehensive study, including evaluation of measures which provide for an ability with low cost VOR/DME equipment.

WHO'S WHERE

In the Front Office

Charles E. Banks has been elected vice president production of National Airlines and Charles F. Sheng is vice president customer relations. William K. Poon has been promoted to general sales manager.

James R. Bushman has become president of Cleveland Corp., Cleveland, Ohio, succeeding Philip S. Jupp, who continues as chairman of the board.

John K. Robinson, chairman of the Convair Co. Transport Board and Deputy Vice President of Air Service, has been promoted to Senior Deputy Chairman. Vice President of Transport, follows the appointment of Charles W. West, former Senior Deputy Manager to the St. Lawrence Seaway Authority.

E. E. Kelly is now vice president of finance-accounting for Air Transport. Roy Roger G. Poon has been appointed as V.P. operations staff, replacing R. G. Downing, now assigned to the position of Manager Airlines.

Kenneth Mason has been appointed vice president of the Civil Aeronautics Co., Long Island City, N. Y., will continue to meet the president in general management.

Changes

Frederic M. Goodall has been elected as senior vice president industrial relations of Pan American World Airways. Donald M. Tolan has been appointed as plant manager, major responsibility of U.S. 111 Main line. May Crowe, Arthur W. Vanden (USAF Ret.) has joined American General Corp., Arroyo, Calif., as a consultant.

R. J. Rosner has become senior chief engineer for guided missiles at Convair's San Diego Division.

Victor A. Olson has been appointed senior vice president of Convair, North Hills, Calif. John A. Wilson is now corporate planner and resident counsel for Helio Helicopters, Palo Alto, Calif.

Kenneth E. Fox has been promoted by National Fuel Co. to chief engineering consultant of Pratt & Whitney Gas Division. Charles A. Whitman is now chief engineer of the PWA, page engineering department.

Honors and Elections

Major Gen. Henry G. Anselberg, USAF, Squadron Commander, has been awarded the Distinguished Service Medal by VI Chief of Staff Gen. Nathan T. Sweeney.

Rose Adair, Richard E. Reid has been cited "for expanding the horizons of aviation" by the International Aviation Trade Show.

H. Charles Lottman, Aero Canada executive, has been appointed secretary of the Canadian Aeronautical Institute.

R. D. D. Hooke, vice president, Aero Canada, Ltd., is the first recipient of the McCord Trophy in award to be presented annually for significant contributions in the field of aircraft design, construction or maintenance.

"four-pound pilot"

A four-pound press, rugged and reliable gyro-laboratory secured as a production tool—is the key to the Arma World Navigation System. This completely self-contained guidance system will be another significant contribution by Arma to precision aircraft and missile operating in the tactical range. Arma Corporation, Brooklyn, N. Y. Graduate City, N. Y. Subsidiary of the American Bosch Corporation.

ARMA ADVANCED ELECTRONICS FOR CONTROL



AVIATION WEEK

VOL. 61, NO. 3

JULY 15, 1954

Exclusive Report From Indo-China

French Fly Old Planes in a Two-Bit War

- Striking force includes B-26s, F4Us, F4Us, SB2Cs and a handful of P4Ys, using one good combat base.
- And there are just as few pilots, who lack cohesive leadership, but it is profitable for contract flyers.

By A. W. Jessup
(McGraw-Hill World News)

Saigon, Indo-China—This has been a two-bit, second-hand war—essentially the air phase. Air combat tactics, if such a term can be used, date long before World War II, equipment, except for a few C-119s, is of World War II vintage.

A scrap of the major French Air Force base in Indo-China reveals:

- Monthly little airplanes. The strike force is made up of three squadrons of B-26s, five of F4Us, one each of F4Us, F4Us and SB2Cs, plus five to seven P4Ys. On the transport side there are 16 C-119s and about three squadrons of C-47s.

Only one airborne worthy of being called a combat field. Formerly at and now at Vietnam's east coast, south North Atlantic Treaty Organization headquarters. The others are short, but brown and adequate may appear—or have that appearance.

There is not one ground-controlled approach (GCA) installation operating in the country or any other intercept time or control equipment.

Every field, even Hanoi is a mess—south Communist Vietnam turns on every side.

• Few B-26 pilots. No one calls it a shortage, but there are just enough pilots to run the few planes here in antiquated tactical operations. One squadron has only three more pilots than aircraft.

The pilots are first rate, but are as degraded that there is no cohesive, aggressive leadership available.

• Civilian workers' incognitum operations in a war zone. Scheduled flights are flown over the non-Communist-controlled areas of Vietnam, Laos and Cambodia. The results are better, but the pilots are better positioned, to have the on-line air-line pilots.

In recent months Agila Air has been able to lose Strathmore and, ac-

cording, DC-6Bs. Pilots receive about \$3,000 per month.

As transportation is about the only means of movement in many parts of this jungle-covered, rebel-infested land, but it is responsible to understand how in such a chaotic traffic can be provided when French air officers say they need more aid to push essential military supplies into Saig, Luang Prabang and Vientiane in Red-Hotland Laos.

• Limited U. S. supplies. Most of the aircraft are supplied from U. S. stockpiles. Maintenance parts, supplies and repair work are flown in by night from Clark Air Base in the Philippines. Necessary parts that are not available from Clark are flown from the large stores of the First Fleet Air Logistics Force in Japan.

USAF technicians, on temporary assignments from their commands in the Philippines and in Japan, carry the main burden of maintenance and overhaul for the B-26s, C-47s and C-119s (Aviation Week July 12, p. 18).

• Little Destruction-Air operations

against the Communists have received little beyond harassment. There is no evidence of major destruction of Red troops and equipment or of interference with Communist military movements.

Characteristics of this war and of the Communist Vietnamese tactics are as responsible for this as the limitations and inadequacies of French equipment. There are no concentrations of enemy troops and supplies, with the single exception of the annual long convoys across the border rather than year. Troops are spread out in small groups and supplies in small dumps.

• Focus. Vietnam—A careful look at the Red River delta in North Vietnam, provides a picture of this war. Newsreels fail. A mass of red dots should indicate the threat of a French Viet campaign. Most of the dots are in Communist Vietnam. Next from the delta the dots trail along the coast southward of Hanoi and running slightly northeast to the sea and a little south of Hanoi. From there the dots trail back to a slightly southeast direction to a point just north of Hanoi, where it branches off to the south. Most of the dots are on the border of Red China.

Within this triangle are 5,000 villages and towns. This is where the newsreels fail. A mass of red dots should indicate the mass that 3,000 of these villages that are under Vietnam control. Most of the dots are in Communist Vietnam. Next from the delta the dots trail along the coast southward of Hanoi and running slightly northeast to the sea and a little south of Hanoi. From there the dots trail back to a slightly southeast direction to a point just north of Hanoi, where it branches off to the south. Most of the dots are on the border of Red China.

Nightly, the Red cut and come the key railroad and highway linking the borderlands of Hanoi with the rest of Vietnam. Trucks have to clear the road and rely the trucks are moving. Before long, however, the Red are expected to keep the constant pressure here out for a day or two at a time.

• Few Strongholds—French Vietnamese forces hold only some strong points on the delta and a few larger towns within the delta. Short of troops because of heavy losses suffered in the defense of Dien Bien Phu, the French are now forced to withdraw steadily from some of its posts and to withdraw others.

In theory, the regrouping of troops is to provide "mobile columns" as the brigades that will slash out at the



Indo-China Fiasco

Indo-China is falling to the Red because of seven years of miserable French tactics, plus seven years of bad politics, a Washington newsman just back from the front reports.

He said the French have little support and have said "give me of what there is."

After being over a thousand airbombs, he concluded that "The French appeared to be willing for British assistance to come, but they, rather than for a direct military support-type force." They have spent on the local air force (the French, not British, and occasionally a segment), whereas the Communists have found doctrine and applied their war on a division level.

The newsman called it "a piddling show"—Bled with blood.

Communist advances within the delta. In actuality, the troops have been down as far as the two perimeter around Hanoi and Haiphong, which must be held at all costs. French commanders admit they cannot fight for any points except these two cities.

► **Red Supply Lines.** In spite of their complete lack of airpower, the Communist Vietnamese retain almost complete freedom of action and movement. They bleed the country and with the people.

Intelligence officers believe the Reds will supply for their forces southeast of the delta through the French-held triangle, either by the overland route around the delta or the tidally held Cameroonian area.

Thousands of boats, carrying 100 or more pounds each, make it across the delta as the night another. During daylight they hide up in the swamps.

ground rooms dug in the Vietnamese delta villages.

► **No Air Targets—Before an operation could take a significant toll of Communist strength, ground forces would have to force the Reds into defensible target areas or communications elements.**

French forces lack this capability, because they cannot tell a Communist Vietnamese from a loyal Vietnamese. A Vietnamese might do the job, but loyal forces are inadequate both in numbers and training for the task.

French officials complain they cannot train the Vietnamese troops with any important position. This probably is true, but the basic cause lies in inadequate training and in the failure of the French to develop years ago a spirited Vietnamese army with a dedicated Vietnamese officer corps.

► **Weak FAF Rules/Weaknesses and**

mediums of the French Air Force. Ironically, an understrength by five or six world critics. The French are viewed little as a combat experience in World War II.

Although many pilots were trained by the U.S. and England and served with units with USAF and RAF, no French jet command was developed and indoctrinated with the new concepts of airpower and its role in the modern war.

Secondly, European defense was divided between Britain and France. Britain was assigned the bomber mission, and France concentrated on fighter defense. Fighter strength was developed almost entirely to provide interception against enemy bombers.

Nothing was done with regard to fighter-bombers or light attack bomber operations. Bomber pilots were directed into the transport command, flying cargo aircraft.

Thirdly, policies in metropolitan France prevented any aggressive use of French air forces in Indo-China. The government decreed that war should be fought with the lightest possible losses, rather than with the maximum destruction of the enemy.

Little wonder in these circumstances that offensive operations had played scarcely a role in Indo-China.

As transport, on the other hand, he helped the French ground forces in success. Scores of military goods have been supplied and maintained by air throughout the region. Without these airlifted supplies French grounds would have been overrun months ago, and this war would have been lost. As it is, half of Vietnam is almost gone, and the other half is threatened seriously.

ODM Lifts Aluminum Forging Capacity Goal

Office of Defense Mobilization has increased the goal for aluminum forging capacity by 108 million lb annually to a total capacity of 594 million lb a year.

Accelerated tonnage allocations previously will be granted for expansion in those four categories:

- **Mechanical forging presses—11.9 million lb annually.** This includes hydraulic presses of 1,500 to 3,500 tons, hammer of 6,000 to 10,000 lb, mechanical presses of 1,600 to 5,000 tons, impact extrusion presses of 1,000 tons or more capacity, with minimum working stroke of 20 in.
- **Upset forging presses—17.5 million lb of 10 in. or greater.**
- **Large forging presses—76.8 million lb annually.** This includes hydraulic presses of maximum 3,500 tons, hammer over 10,000 lb, and mechanical presses over 3,000 tons.

ARDC to Build New Ejection Test Sled

Air Research and Development Command aims will start construction of \$2,000,000 ejection test sled, step a 1,500-ft. test in Utah to test experimental ejection seats and capsules for emergency escape from supersonic aircraft.

Sled tracks will end at the edge of the mesa, and the ejection seat or capsule will be tossed into air at that point as both sled and device are backed over the mesa's outcrop. Test sled and escape device will be recovered by parachute descent at the foot of the mesa.

► **\$2-Million Cost—Testing of the \$2-million facility is scheduled to start within 14 months.** Contract for construction has been awarded to Coleman Engineering Co., Los Angeles.

ARDC operates other ejection test test at Holloman Air Development Center, N. M., where Lt. Col. John F. Stapp was currently paroled on the track at 400 mph, at Edwards AFB (Aviation Week June 14, p. 18).

► **Rocket Push—ARDC will conduct the tests with a rocket sled and a test sled.** The rocket-powered sled will chase the test sled along the tracks and then will be halted by a braking device, while the test sled goes over the edge of the cliff. Test sled will be given an added boost by a nuclear rocket.

Engineering data will be secured from the instrumented escape devices and from photographic coverage of the tests.

Eisenhower Orders Air Transport Study

Airline transport policy recommendations of the Air Coordinating Committee set up for a recommendation by a Cabinet-level committee on transportation, headed by Secretary of Commerce Stephen Weeks.

Authorizing the appointment of the "Committee on Transport Policy and Organization," President Eisenhower said:

"A comprehensive, up-to-date review of overall transportation policy and problems is needed as an aid in assessing the overall economy of government policies and programs concerning public branches of the transportation industry. Also, the organization of the federal government to cope with transportation problems should be reviewed."

Other members of the committee are director of the Civil Aeronautics Administration, Charles E. Wilson, Secretary of Defense, Arthur E. Wilson. The President instructed the committee to make its report by Dec. 1.

Airline Subsidy Estimates			
Following are the first 1955 subsidy estimates of the seven airlines operating separate divisions that Congress reported would not be offset by the Supreme Court decision regarding the effect of domestic savings against international subsidy payments			
Airline	Domestic subsidy estimate	International subsidy estimate	Total 1955 subsidy estimate
Alaska Airlines			\$2,340,000
Alaska Airlines	\$1,740,000		
Alaska Airlines	600,000		
Boeing Airways	500,000	\$1,950,000	5,490,000
Boeing Airways	500,000	45,000	505,000
Boeing Airways	750,000	750,000	1,500,000
Boeing Airways	1,247,000	1,247,000	2,494,000
Boeing Airways			2,741,000
Boeing Airways	1,810,000		
Boeing Airways	1,170,000		
Boeing Airways	1,013,000		
Boeing Airways	4,960,000	4,960,000	
Total			\$4,412,000

Airlines Clash on Offset Proposal

Board says court decision will have little effect on subsidy needs; PAA, Panagra fight nullifying bill.

Civil Aeronautics Board Chairman Chas. C. Gurnea has advised Congress "there is little likelihood" the Supreme Court decision directing the offset of profits of one division of an airline against losses on another division "will have any material effect" on the first 1955 replacement of \$73 million for subsidy payments.

Congress set the amount to \$40 million. The House and Senate Appropriations Committee requested the Board to reevaluate the subsidy bill in the light of the Supreme Court decision in the Delta-CGS Air Lines case (Aviation Week Feb. 8, p. 11) and report to the two groups at the opening of the new Congress in January.

► **Executive Unlikely—Gurnea's report says "no effect on fiscal 1955 estimates is anticipated" as a result of application of the offset principle to these seven airlines operating separate divisions: Trans World Airlines, Pan American World Airways, Northwest Coast Airlines, Delta-CGS, Colonial Airlines, Boeing Airways and Alaska Airlines.**

The Board has estimated their total fiscal 1955 offset requirements at \$43.4 million.

The Gurnea statement was submitted to Chairman J. Lee Rankin of Senate Interstate and Foreign Commerce Committee. The committee is considering legislation, introduced by Sen. Pat McCarran, nullifying the decision and

permitting CAB to continue determining what pay rates and subsidy payments on a division basis.

► **Estimate of the controversial measure is a subsidy. CAB is supporting it.** Post Office Department is opposing it, arguing that "big government savings" might be made through the offset provision (Aviation Week June 28, p. 8).

► **Alaska Fight—Alaska Airlines representatives claimed at a Commerce Committee hearing.**

► **The two off-international airlines, Pan American and Pan American-Globe Airways, opposed the measure on grounds it would give domestic-international carriers a competitive edge over both their domestic and international counterparts.**

"When TWA takes a passenger from London to Los Angeles," PAA vice president (Aviation Week Feb. 14, p. 11) said, "the fact that TWA is an international service gives it the message not to compete with London to New York but from New York to Los Angeles."

He said the McCarran measure "would not only be punitive for the domestic carriers engaged in international operations, the same right to excessive domestic profits as a by-product of domestic operations . . . but would give domestic carriers a competitive edge over both their domestic and international counterparts."



'Educated Guess' of Lockheed XF-104

Reported to be a dash of the new Lockheed XF-104 fighter jets. "Too modified" designers called in the "vortex jets" as the new Lockheed, which weighs only some 15,000 lb., is powered by a Wright J65 turbojet engine with an afterburner.

Reported to be a dash of the new Lockheed XF-104 fighter jets. "Too modified" designers called in the "vortex jets" as the new Lockheed, which weighs only some 15,000 lb., is powered by a Wright J65 turbojet engine with an afterburner.

perhaps, play ahead from their interrelated sides as well.

Chicago Vice President Kenneth Lawie claimed the recovery of profits by combined carriers would open the way for them to finance "an intensification of their international operations, thus adding to the real need of a well-organized operating center, such as Panagra, or leaving Panagra to reduce its services."

• **Russell Newlin**, president of Southwest Airlines, pointed to the opposition. He contended it would keep Pan American as a threat on their side.

Pointing to CAA's policy as to non-discrimination in air services, Newlin objected. "It is only human nature, when given the ability to allocate resources between divisions to allocate these expenses as they feel they will be most favorable to the person making the allocation. We cannot expect that Pan American does otherwise."

• **Camelback Bell-Patt**, domestic administration editor, agreed. Their view:

• **Edmond Leveson**, representing Northwest, said NACA now is struggling to keep its domestic service on a 45-cent-a-mile subsidy and will rely on the hope that through economies it eventually will be able to build up a profit.

The officer points, he added, "would dictate to management the interests of consumers, requiring an increase in its domestic mail rate, thereby placing Northwest on a capital basis for its future interests."

• **Wesley Lee Plesner**, TWA's board chairman, charged that airlines have been "asked" to believe the Board would not affect domestic earnings against actual subsidy requirements. Under his proposed domestic rate 3c, and TWA earned only 2.95c per mile from 1948 through 1959. Its cost for a per cent rate for the North Atlantic Division from 1947 to the present now is pushing.

Thomas and "Under the Supreme Court decision, the Post Office Department now claims that the domestic profits of only the last few years should be used to offset our need for international mail pay for the past eight years, a shocking domestic bribe of earlier years." If the view is proved, he added, "there is sure to be a long period of litigation."

• **Hebert Schneider**, representing Boeing and air transport companies, reportedly said American Airlines executives and "most bird thinking" acquiring aircraft similar to American's DC-7s. "There exist a few small airlines, but the decision of Boeing calls for a great deal to be devoted to its international Division."

• **Edith Coker**, assistant to the president of Delta-Coke, charged that PAA's support of the object principle "amounts to a resurrection of the classic airline cartel question."

"In that context, it would be PAA's large share in U.S. domestic transportation in the international field who also have domestic operations could be forced out of the international field. In fact, 'It would suggest that the airline's loss international in policy of having more than one U.S. air carrier operating in the world beyond our immediate parameters is to be reversed, not through cost, deliberate decision, but through the unilateral concentration of a control by the largest carrier of the CAA's position of being mail rates by division'."

During his attack at TWA, PAA's Francis said the argument that the effort policy "is a device of Mr. Harvard Hughes" and the other combined domestic-international operators of their incentive to combine international operations.

"Combined domestic-international operation does not benefit for their domestic operations from their international service that they are not going to shoulder the heavy burden because of the current profits above the domestic service, that is due to international operations, but to be able to sustain them."

Comet Verdict?

- **Announcement of crash cause appears imminent.**
- **Tests jet 30-foot hole in jet liner's fuselage.**

(McGraw-Hill World News)

London—An announcement on the cause of the Comet crash that resulted in grounding the jet transports last April appeared imminent last week following completion of the initial round of balloon tests in which a half inch was revealed.

A Comet submerged in water at the Royal Aeronautical Establishment at Farnborough was broken up after six weeks of balloon tests simulating stress loads of actual flight operations.

A 34-foot length of the fuselage section, equal to a violent explosion at the wreckage site, shrank.

Isolated sources here say testing that has been repeated but possibilities have narrowed to two or three main causes, including pressurization fatigue and/or fatigue (American Wire July 5 p. 14).

• **Comet Weakness**—Crack of the 38-in. diameter was found below the cockpit. Right wheel had been sighted by radar and high speed. It reflects either structural or design weakness.

But this is not necessarily the final cause of the crash. The fact remains on pressure loading still is a possibility. Tests on both these remaining possibilities are continuing.

The reported findings have been published and it is being subjected to more preliminary tests, both to check preliminary conclusions on causes of Comet troubles and to permit as much data as possible on the nature of pressurization.

• **Important Lesson**—The Comet is the first aircraft to be subject for so long to such criticism of pressure variation. These critics are now expected to be limited for every matter of personnel action.

It is an interesting possibility that flying will not only be as the cause of the two Comet crashes and the loss of the Comet 1, but also the cause of the Comet 2 crash, the primary reason for the tests.

Not only was it that a number of military tests already in service, both here and abroad, now have to be inspected for safety, but they are being held up under similar flying conditions.

• **New Modifications**—At one time, it became more doubtful the Comet 1 will return to active commercial service. It now appears that whatever caused the Comet crash, extensive modification of the structure will be required not only on the Comet 1, but the Comet 2, as well as the Comet 3, which is already in service.

This may be possible only in a small scale weight penalty, and the Comet 1 already has quite a high break-even loss level.

Of the original 16 Comet 1s, an average of 160000 miles and two more probably are unserviceable after crash tests. The latter group of which British Overseas Airways Corp. has four, Air France three, and Union Air France and Transport one. All will have Comet 2s on the way with Avion Progress and better fuel efficiency, engine and better fuel efficiency. This way will decide that small Comet 1s built since Comet 2s are not worth it.

Meanwhile, the British would like the Comet 1s to be replaced by the Comet 2s, which are being built by the jet companies, and the Comet 1s are being built by the jet companies.

It is not likely that the present Comet 2 will be replaced, although no definite action is likely until final decision of the crash cause and the decision of the British of necessity.

modification to the Comet 1 and efforts as performance.

• **Comet 2**—The Comet 2 has more money than the Comet 1. The 2's break-even loss factor is below 50%, compared to 70% for the Comet 1.

• **Comet 3**—The Comet 3 is a new flight test, and a number of 2s are undergoing problems on flight tests. The latter probably will be modified for modifications after the Comet 1 findings.

NMB Awaits AA Strike Zero Hour

Airline-ALPA exchange charges over ruling allowing pilots to exceed eight hours nonstop cross-country.

Intervention by National Mediation Board was the only means remaining last week of stopping the strike of more than 1,300 American Airlines pilots, scheduled to start July 15 (American Wire July 12, p. 85).

The strike was called by Air Line Pilots Assn., which is a member of the Civil Aeronautics Board of the eight-hour limit on transcontinental nonstop flights.

NMB apparently was waiting until the strike to announce its decision on whether it would intervene in the dispute in order to keep the airline operating. Under the terms of the Railway Labor Act, which the government as transport labor disputes, NMB is not permitted to step in if a railroad can offer its services "if a labor emergency is found to exist."

Since both United and Trans World Airlines pilots were expected to vote in favor of a strike, it is possible that NMB would consider the airline as an emergency, by which, neither United nor TWA strike rules had been created. Stricter measures made it difficult to gather as all the ballots.

• **Boeing Fuel**—Meanwhile, charges and countercharges were exchanged by American and ALPA. Just before AA strike was scheduled to start, that developments brought the expected strike to the breaking point.

• **C. R. Smith**, American president, promised his employees that if a strike were called, ALPA's efforts would be held accountable.

• **Smith** said C. N. Smith, union president, that he considered ALPA's action "not only an irresponsible disregard of the safety practices of government and the industry, but a flagrant attempt to breach contractual and statutory obligations that would inevitably result in damage to this company through its economic losses and more importantly through loss of public confidence in the safety of American Airlines services."

• **Smith** said Smith "We cannot be

even, and especially not completely satisfied."

The Comet 2 has more money than the Comet 1. The 2's break-even loss factor is below 50%, compared to 70% for the Comet 1.

The Comet 3 is a new flight test, and a number of 2s are undergoing problems on flight tests. The latter probably will be modified for modifications after the Comet 1 findings.

NMB Awaits AA Strike Zero Hour

Airline-ALPA exchange charges over ruling allowing pilots to exceed eight hours nonstop cross-country.

Intervention by National Mediation Board was the only means remaining last week of stopping the strike of more than 1,300 American Airlines pilots, scheduled to start July 15 (American Wire July 12, p. 85).

The strike was called by Air Line Pilots Assn., which is a member of the Civil Aeronautics Board of the eight-hour limit on transcontinental nonstop flights.

NMB apparently was waiting until the strike to announce its decision on whether it would intervene in the dispute in order to keep the airline operating. Under the terms of the Railway Labor Act, which the government as transport labor disputes, NMB is not permitted to step in if a railroad can offer its services "if a labor emergency is found to exist."

Since both United and Trans World Airlines pilots were expected to vote in favor of a strike, it is possible that NMB would consider the airline as an emergency, by which, neither United nor TWA strike rules had been created. Stricter measures made it difficult to gather as all the ballots.

• **Boeing Fuel**—Meanwhile, charges and countercharges were exchanged by American and ALPA. Just before AA strike was scheduled to start, that developments brought the expected strike to the breaking point.

• **C. R. Smith**, American president, promised his employees that if a strike were called, ALPA's efforts would be held accountable.

• **Smith** said C. N. Smith, union president, that he considered ALPA's action "not only an irresponsible disregard of the safety practices of government and the industry, but a flagrant attempt to breach contractual and statutory obligations that would inevitably result in damage to this company through its economic losses and more importantly through loss of public confidence in the safety of American Airlines services."

• **Smith** said Smith "We cannot be

even, and especially not completely satisfied."

The Comet 2 has more money than the Comet 1. The 2's break-even loss factor is below 50%, compared to 70% for the Comet 1.

The Comet 3 is a new flight test, and a number of 2s are undergoing problems on flight tests. The latter probably will be modified for modifications after the Comet 1 findings.

• **Boeing Fuel**—Meanwhile, charges and countercharges were exchanged by American and ALPA. Just before AA strike was scheduled to start, that developments brought the expected strike to the breaking point.

• **C. R. Smith**, American president, promised his employees that if a strike were called, ALPA's efforts would be held accountable.

• **Smith** said C. N. Smith, union president, that he considered ALPA's action "not only an irresponsible disregard of the safety practices of government and the industry, but a flagrant attempt to breach contractual and statutory obligations that would inevitably result in damage to this company through its economic losses and more importantly through loss of public confidence in the safety of American Airlines services."

• **Smith** said Smith "We cannot be

even, and especially not completely satisfied."

The Comet 2 has more money than the Comet 1. The 2's break-even loss factor is below 50%, compared to 70% for the Comet 1.

The Comet 3 is a new flight test, and a number of 2s are undergoing problems on flight tests. The latter probably will be modified for modifications after the Comet 1 findings.

• **Boeing Fuel**—Meanwhile, charges and countercharges were exchanged by American and ALPA. Just before AA strike was scheduled to start, that developments brought the expected strike to the breaking point.

• **C. R. Smith**, American president, promised his employees that if a strike were called, ALPA's efforts would be held accountable.

• **Smith** said C. N. Smith, union president, that he considered ALPA's action "not only an irresponsible disregard of the safety practices of government and the industry, but a flagrant attempt to breach contractual and statutory obligations that would inevitably result in damage to this company through its economic losses and more importantly through loss of public confidence in the safety of American Airlines services."

• **Smith** said Smith "We cannot be

even, and especially not completely satisfied."



British Army Buys New Liaison Plane

Expanding major design changes in the new British Army Liaison Plane has been announced in a 180 hp. Blackburn Bombardier with direct fuel injection. Carrying two or three persons the A.O.F. No. 19 is 277 mph top speed.

OMOHUNDRO MEANS "FIBREGLASS COMPONENTS" IN THE AIRCRAFT INDUSTRY



Model of Lockheed G-128 turboprop medium transport

OMOHUNDRO is today a name that bears a special and increasingly important significance in the rapid development of the aircraft industry.

By entrusting to Omohundro the production of major components in many of the outstanding aircraft being built today, the aircraft industry has signified, in the most substantial manner, its endorsement of Omohundro standards for precision fabrication of fiberglass airplane parts.

Our Engineering staff will be pleased to cooperate in the development and production, to Omohundro standards, of structural parts and non-structural components in fiberglass laminates. Contact Paul Omohundro Co., Box 694, Paramount, Calif. Phone: TOrey 6-1961.

Working on panel of G-120 vertical fin



Southern Representative: C. P. Waypover Co.,
Box 1267, Grand Prairie, Texas

Ladder is difficult to handle, costs valuable time.



Ramp takes three passengers simultaneously.



CAA Tests Reveal Evacuation Lessons

(Editor's note: Passengers in an American Airlines Convair 440 suffered minor burns as they emerged by ropes after the aircraft crash landed recently at Columbus. This points up the importance of new test results, reported here by AVIATION WEEK.)

Passengers in an airplane equipped with an evacuation slide at an exit door would have to better chance of survival in event of fire or crash today than those surviving in aircraft using other known methods, says Dr. Barry G. King, research executive of Civil Aeronautics Administration's Medical Division.

In extensive tests conducted by Dr. King and his associates, in collaboration with the military services and airlines, they have determined:

- Use of an escape slide instead of a ladder reduces the average individual time for descent to ground by about 51%. A ramp that can be used by several persons simultaneously, similar to the one on the Convair 440, reduces the latter time by 46%.
- The time required to go down and get out of the slide can be reduced by about 38% if the slide is held at the proper angle and height.
- If the passenger is made to jump into the slide rather than permitted to sit on the floor and push into it, the time to get on to the slide is reduced about 57%.
- Time saving that can be achieved by

Slide stretches farther than ramp, reduces ladder time 51%.



AVIATION WEEK, July 18, 1964



ESCAPE ROSES board passengers' hands as they climbed to safety from AS 240

setting passengers so that all available exits are utilized fully is difficult to estimate. Analysis of motion picture records has shown periods during which individual exits were not used were long enough to permit the escape of those in one passenger.

• Crew training in emergency evacuation procedures is of paramount importance in escape time, because it is only through effective passenger handling procedures that the maximum time losses can be eliminated.

In the most recent of the major evacuation studies conducted by Civil Aeronautics Laboratory for United Air Lines, it was found the crew experience gained through eight successive trials, enabled the crew to evacuate a plane load of passengers with no great

points out that in presently designed aircraft two persons to hold either side is enable other passengers to slide. However, Air Canada's Capt. Dennis N. J. has developed a prototype of a flexible elastic slide that, when released, is self supporting. It requires no handling, and since it can be so easily released it is also quicker.

Louise, as possible even under its conditions where rescuers holding the slide could not stand prolonged exposure to the heat," says Dr. King. "Further, the time required for packing this device into use is only 7 sec. as compared to — 15 sec. required for preparation of the hand-held slide."

Together with its bottled air supply, the prototype slide weighs less than 40 lb. When packed ready to use, it is about 13 in. long. It was developed in 15 months. But Air Canada claims this is not the final answer to the problem, and it will continue to improve its model.

The prototype was designed for the DG-6, but production slides are expected to be developed for all types.

• Ropes, Ladders—Civil Air Regulations provide that all aircraft having floor level exits are to have at least one method of lowering passengers to the ground. Some airlines already have installed the slide system, others still use ropes or ladders.

Investigators have found that use of ropes and ladders in tests results in considerably more injuries to passengers than the slide method. In addition to being burned sliding down the rope, there is danger of phasing up at the bottom in the haste of evacuation.

Both rope and ladder methods also are difficult for aged passengers to handle.

• Fire Tests—About 25% of U.S.

Slide evacuation time can be cut by three methods of escape . . .



WYSCOFF method is shown out.



HANDBAR cuts 20% from aircraft time.



JUMP speeds passenger escape by 25%.

BEFORE
INSTALLING
Sperry Engine
Analyzers.
Average monthly
delay 654
minutes

AFTER
INSTALLING
Sperry Engine
Analyzers.
Average monthly
delay 347
minutes

Eastern Air Lines Reduces Ignition Delayed Time **47%**

Records show Sperry Engine Analyzers also reduce number of replacement units.

Last fall Eastern Air Lines compared three months of operation using Sperry Engine Analyzers with the same three months of the previous year before the Analyzers were installed.

Here are the results per month:

• Average number of ignition delays each month dropped from 9 to 6—a reduction of 33%.

• Average delayed time dropped from 654 minutes to 347 minutes per month—a saving of 5 hours, 7 minutes, or 47%.

• Average number of defective units returned per month dropped from 97 to 73—a reduction of 25%.

Other savings, too.

These savings relate only to ignition-theft, distributor failure, ignition coil, ignition leads, magnets and spark plugs. When you consider the additional savings in fuel from more

efficient engine operation, it's easy to see why Eastern's engine fleet engine fleet is now being equipped with Sperry Engine Analyzers—and why they've been specified for Eastern's newest new Douglas DC-7s.

For a Sperry trial presentation, or more details write immediately to: Sperry Engine Analyzers, Inc., 1000 Broadway, New York 10, N.Y. or Sperry Division, General Electric Co., 1000 Broadway, New York 10, N.Y.

SPERRY HYDROSCOPE COMPANY
A DIVISION OF GENERAL ELECTRIC CO.

AGGENT NEW YORK • CLEVELAND • NEW ORLEANS • BIRMINGHAM • LOS ANGELES • SAN FRANCISCO • SEATTLE
IN CANADA • SPERRY HYDROSCOPE COMPANY OF CANADA LIMITED, MONTREAL, QUEBEC

DC-7

NEVER BEFORE
such Magnificence . . . such Power
such Performance!



and **NEVER BEFORE** has the
A. W. HAYDON COMPANY been so
proud of its contribution...

In the never-ending conquest of the vast barriers of space and time, Douglas goes ever forward meeting every challenge that men and machines must face. The newest — and brightest — star in the aviation firmament, the Douglas DC-7, is truly a miracle of the mastery of men over machines... and in this great work system A. W. Haydon testing devices play an important part.

We at A. W. Haydon take pride in our contribution toward bringing a mass of metal and machinery into integrated performance which meets Douglas' high standards. Integrated performance is born of a multi-tude of small component parts, working in perfect mechanical and electrical coordination. The A. W. Haydon precision timing instruments are a vital part of this vast network.



DOUGLAS DC-7, the ultimate in comfort, safety and safe air travel. Swift, luxurious, dependable — the new DOUGLAS DC-7 justly deserves the accolades it is receiving.

- ✓ A. W. Haydon Time Delay Relay is a very important component of the automatic feathering system.
- ✓ A. W. Haydon Time Delay Relay meets demands of prop feathering.
- ✓ A. W. Haydon Repeat Cycle Timer is a vital part of the prop deicing equipment.
- ✓ A. W. Haydon D.C. Timing Motors are used in the reliable presentation systems.



Circle 10 on Reader Service

scheduled domestic and international flight accidents during the past three years involved less, according to Civil Aeronautics Board figures. Worst series of the firm, another in line of life is concerned, occurred while the aircraft were on the ground, Dr. King says.

Consideration in CAA tests must therefore be given, he says, to:

- How long passengers can survive face of the intensity occurring in crashes
- How fast it is possible to evacuate passengers with present equipment

National Advisory Committee for Aeronautics has determined from tests on the habitability of interiors of airplanes that approximately 30 sec would be available for escape in all but the most severe fires. However, in most cases, passengers must move away from burned hangings done in 7½ sec.

"Under the conditions of fires which resulted in the NACA four experimental crashes and for the two hangover tests, 90 to 105 sec. were available for escape in four of the tests, and 53 and 65 sec. in the remaining two tests," King says. "Some passengers would have been able to survive for from 95 to 125 sec. in five of the six tests if they had happened to be in the right part of the cabin."

"Thus in these intense fires, an escape time of 90 sec. would have been consistent with survival of all passengers in four cases and a few passengers in a fifth case."

• **Usable Exit-From** reports prepared by CAA on exit availability in 213 air carrier accidents between 1946 and 1951, he points out, indicate that about 60% and those over the wings are less likely to be usable than those at the wings.

Escape through a window exit over the wing is difficult but can be accomplished by most passengers, King's tests reveal. Where windows are not over the wings, the advantage of looking is lost and a relatively long drop to the ground is involved when the airplane has its gear down.

"Calculating theoretically possible escape times for a specific airplane, either current or projected, and a specific accident," says King, "is to determine the area in which people can escape from aircraft to the ground through the number, type and location of available exits."

Purpose of the progress of tests is to determine what the favorable and less favorable characteristics of exit arrangements are and to identify the specific causes of time losses due to passenger behavior or passenger handling procedures.

Analysis of studies of exit characteristics are applicable for new airplanes. Those on time losses due to time are applicable for today's airplanes and operations.

MISSION CROSLY

COMBINE

ON

DELIVERY

TARGET DESTROYED, solution complete—the missile never misses. And because it is as vital to maintain our missile strength, the Military can look to Crosley's manufacturing facilities for major missile sources.

Trained and skilled to build the entire missile, AVCO, through Crosley and other divisions, can supply every major component—electronic logic, hydraulic control, command control, telemetry, rocket power, detaching fins, as well as the missile surface.

And past performance proves that Crosley offers real assurance of peak production standards and prompt deliveries.

"Right and On Time," an illustrated booklet describing Crosley facilities for military production, is available to Procurement Agencies and defense contractors. Be sure to write for your copy today, on your business letterhead.

ENGINEERS—Detailed experience of long range research and development, defense contracts in electronic, electro-mechanical systems and the widest systems research capabilities for higher skilled engineers. Contact our Director of Engineering.

CROSLY
GOVERNMENT PRODUCTS
DIVISION 
CINCINNATI 23, OHIO



ON THE CANNING LINE. Technicians work for engine air-cleaning, check pointing procedures.



DETURBULANCE. G-E techs use on-board "vibration-check" to help prevent with anti-brake and maintenance problems.



CLASSROOM SESSIONS given by G-E jet engineers help pilots and mechanics learn a better understanding of G-E technology.



FLIGHT OPERATION. G-E techs are available throughout the world—wherever, whenever needed.

G-E jet service helps keep F-86D's READY FOR CONTINENTAL DEFENSE

G-E service engineering at U.S. Air Force Bases helps maintain high percentage of aircraft readiness by speeding engine maintenance

General Electric jet service engineering has one all-important objective—to help G-E turbojet users get the highest possible utilization from their engines at all times.

For example, take the 71st Fighter Interceptor Squadron at Conopsa AFB, an Air Defense Command Base near Pittsburgh. There G-E techs work with USAF maintenance personnel to maintain high availability of North American F-86D's.

Besides improving engine maintenance and overhaul procedures, the techs use latest turbojet repair techniques by applying new and improved service techniques developed from G-E operating experience.

General Electric jet service engineering at the Pittsburgh area is, of course, part of G-E's world wide jet service program. G-E techs are stationed in Japan, Greenland, Germany, England, Puerto Rico, Alaska, Italy, Africa, and Korea. In the United States, jet representatives are available to airframe manufacturers, the Air Force, and the Navy from coast to coast.

For further information on this program, contact a G-E Aircraft Specialist. He'll be glad to tell you how G-E service engineering can go to work for your aircraft—today, or five years from now. Section 210-29, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—
GENERAL  ELECTRIC

READY TO SHOOT a new G-E J47-17 engine, personnel of 71st Fighter Interceptor Squadron take on G-E techs up without necessary stops.



DIAGNOSIS is conducted by G-E techs to avoid USAF personnel on repair and servicing techniques. Before, G-E engineers examine thoroughly engine to check.





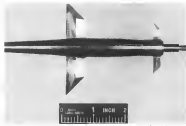
REICHSBOMBEN III, proposed supersonic rocket airplane, was intended to be third in postwar research aircraft series. Design was never carried through construction, but plane would have looked like this sketch by Armin Weckert.

R III: NACA's Non-Flying Trail-Blazer

By David A. Anderson



IN THE TUNNEL, model is prepared for supersonic tests. Boasting from the press duct during starting made maintenance of sharp leading edges a difficult problem.



SMALL SIZE of model for supersonic tests of proposed rocket research aircraft was due to available tunnel dimensions in 1945. Improvements in model construction yielded drag results obtained from tunnel tests. But this gadget exhibited some goofs.

Reichsbomben III was a great idea but it never flew.

The little airplane with the big name was originally proposed as the third plane in the NACA's postwar high speed research aircraft series. Its performance was estimated to be supersonic, up toward the Mach 2 mark; it would have been propelled by a rocket engine which made up most of the baggage.

But instead, the Douglas X-3 became the third plane in the research group, and so Reichsbomben III is today only of academic interest. Its design was very advanced for its time, even judged by today's standards, it exhibits some unusual features.

► **Construction.**—When the R III was first planned, the aircraft industry was being flooded with captured German engineering data. Many of the U.S. designs then on drawing boards were being scrapped in the light of new knowledge on jet propulsion and high speed aerodynamics.

"It was so bad that we felt we didn't have a chance of getting anywhere with any proposal that didn't have some kind of a German name," said an NACA scientist, "so for laughs, we called it Reichsbomben, which means 'deity snail'."

(This incident may have led to the often repeated and completely erroneous story that the R III was a copy of a German research design. It is not too unreasonable a path for a good story to make.)

The only light side of the project was its name. NACA was faced with a

marion's approach

TO
INSTRUMENT MECHANISM
DESIGN . . .

In any aircraft instrument system, reliable performance depends on an instrument mechanism, which presents the information accurately, readily, simply and satisfactorily to the pilot. To Marion, who studies both existing and modifications to components of instrument systems and complete integrated systems, this means carefully designing mechanisms to incorporate system objectives in the performance of vibration, rapid attitude changes and other advances with full realization of the human elements involved.

This approach is represented by Marion's MGP-1 and Control Mechanisms, which were designed to meet specific performance requirements in an instrument assembly for turbo-propelled use. The MGP-1 exhibits exceptional open-like stability even under the influence of severe vibration and rapid attitude changes. The Motion Control Mechanism is an extremely small, lightweight and rugged instrument for performance and durability equal to that of much larger and heavier aerodynamic mechanisms.



Copyright 1954 Marion

There are typical Marionisms by Marion — a marriage of craftsmanship in instrument design to better meet the varied needs of specific applications. Marion creates your inquiry concerning the capabilities of

Marion. Many solutions in your problems.

Marion Electrical Instrument Company, 412 Canal Street, Manchester, New Hampshire, U.S.A.

marion meters

MANUFACTURED BY MARION ELECTRIC CO. "BULLDOG" METERS AND RELATED PRODUCTS

Reg. U.S. Pat. Off.





A.E. "Duke" Kings
Cessna Service Manager

At Cessna Aircraft...

"Cherry Rivets have proved dependable—
save time and maintain highest quality"

"At Cessna," says A. E. "Duke" Kings, Cessna manager, "we use Cherry Rivets throughout our commercial and military planes in hundreds of places. In fact, we find that when modifying our planes from fabric-covered to all-metal models, Cherry Rivets have proved dependable in 'bolt-together' jobs."

That service manager speaks from his many years of experience in aircraft assembly and field service work in the aircraft industry. "For those blind spots in airplane assembly—the control flap door hinges, on the door ribs and posts, attaching lead-in rivets on the rubber tips, attaching brackets between the skins of gas tank panels, on the windshield runners where an air duct protrudes out of a fuselage bay—Cherry Rivets are an absolute necessity."

"And in the field," those comments, "we have a stock recommendation about these rivets—we tell our distributors that Cherry's own experience shows that Cherry's rivets are dependable and the highest quality rivets in areas that are difficult to reach."

For detailed application information, write for Bulletin 92-76.

THE MANUFACTURING AUTHORITY
Townsend
COMPANY • ESTABLISHED 1916

1000 South Main Street, Portland, Maine

Sales Offices in Principal Cities

1000 South Main Street, Portland, Maine

In Canada: Foremaster & Bullock Manufacturing Company, Ltd., Downsview, Ontario

general lack of any data on which to predict performance or produce a design for a supersonic aircraft. The data they needed to get came only from a thorough study of the problem.

The first part involved a complete analysis of a supersonic engine power plant; the second carried out the preliminary design of a possible engine, and the third part compared of vital design points of the configuration.

Final report on the project was issued in December 1945 in an advanced confidential report (ACR, No. 15112) and has only recently been declassified.

► Thus, Conclusions—Summing up the analysis and design work, the NACA scientists reached three conclusions which were—and still are—fundamental concepts in integral design: 1) Shape and aerodynamic characteristics of outside surfaces being bearing supersonic engine systems are closely related to the internal operating conditions of the propulsion system.

► Supersonic stability of slender bodies of revolution which admit air at the nose may be achieved with surfaces of reasonable size.

► Large power engines appear possible with nozzle propulsion for a supersonic airplane with a correctly designed body. The final configuration of R-11 has built around an integral strap propellant with a 47-in. diameter at the burner section. Forward of this, the fuselage tapered to an inlet of about 18 in. dia.; exhaust nozzle was about 18 in. dia. Overall length was 34.5 ft. and wingpan was about 20 ft.

The pilot compartment was built into a central strut; one of the few criticisms of the design could be detected here, because the engine's maximum weight was only 18 lb., tapering to about 15 lb. around the pilot's buttocks.

Wing area was specified at 65.5 sq. ft.; gross weight ready for towing of the recovery was estimated at 2,500 lb.

► Powerplant—Design—Fundamentally the most simple of engine designs, the simple type with pilot inlet still permits reasonable complexities in analysis and application.

One of the conditions imposed by NACA for simplicity was that the geometry of the engine would be fixed. It would be determined by the desired design conditions, and any other air entering points for the engine would have to be accepted as off-design points with attendant losses.

They recommended three bores, though, one of the strong recommendations was the arrangement of ramjet geometry intake and exhaust nozzles.

The recent design calls for a nozzle cold structure just inside the pilot inlet, with subsonic diffusion behind the shock to a region just ahead of the constant-area burner. A cooler body

being located into the vertical shock which leads the pilot. All of the combustion chamber, the area induces again to a supersonic state.

Calculated thrust coefficients (defined as thrust divided by the product of dynamic pressure and nozzle inlet area) increase with altitude for constant flight Mach number up to the subsonic level, above which they remain constant. But at altitude increases, velocity and dynamic pressure both decrease for constant Mach number; the fall off of pressure is so rapid that it overwhelms the rising value of the thrust coefficient. The net result is that absolute thrust decreases with altitude increase.

► Airplane Design—Thus basic sound analysis dictated the integral design approach to the R-11.

► Supersonic flight speed should be sustained for about three to five minutes. ► Pilot and/or darts recording equipment should be carried. ► Small size and simplicity should be stressed.

It was also decided that the airplane should fly definitely below the transonic region, but that it should not be required to go much faster. Two air intakes were cited. Fuel rate increases considerably with higher flight speeds, and high skin temperatures would be encountered.

Mach 1.4 was settled upon as the design point.

Simplicity meant that the engine would be used only for supersonic propulsion, and that auxiliary power as means would be needed for takeoff, climb and recovery flight. The wing design would have to be capable of subsonic flight and landing.

This led to the suggestion that it might be possible to run the loaded airplane at a recovery and to abort. Another rocket would accelerate the plane through the transonic region. Supersonic flight would be with rocket power only, and after the short burst, the plane would glide subsonically to a landing.

► Fuselage Length—Minimum diameter of the fuselage was determined by the size of the smallest well to accommodate a pilot. The chair was considered to come about tangent to the middle section, so that the size of external canopy would be minimized.

The limited data available on supersonic diffusion forced the NACA scientists to choose the better of two angles for the conical nose; otherwise their choice was a 3-deg conical angle. The subtraction of the pilot's well made this impractical and forced the external nose contour to a 6-deg angle.

With body size fixed, the body and other weights could be estimated. Wing area was determined by the requirement that the plane land at 100 mph, using an estimated lift coefficient of 0.9,



You Get Economical, Quick, Secure Fastening with Townsend Tapping Screws

You enjoy the economy of quality when you use Townsend tapping screws. They are made in portable in many methods of securely fastening metal, plastic, wood, asbestos and composites with efficiency.

The use of Townsend drilled forming screws eliminates costly tapping operations on the preformed or drilled sheet metal. A tapping screw drives the screw in driven into the material. They not only save in cost, time, and weight, and a variety of one-step in assembly. They may be installed and replaced without impairment of their holding power.

Townsend drilled forming screws have no self-center drill which produces a true, sharp, clean, wide, clean hole which acts as a top when the screw is driven into it and applied loads. By carrying their own thread, these screws fit tightly and most fastening

from vibration. There is no chance of any discrepancy between screw and tapped hole.

Townsend tapping screws are available in the sizes shown here in a variety of head styles with drilled or Phillips rounded and hex heads. They are the new group of the Townsend family of 10,000 types of standard and special fasteners and screw parts used by all industry to improve assembly and speed production.

As representatives of "The Fastening Authority" Townsend manufactures over 600 types of standard fasteners and screws. We have the experience in new design and cold forming to help solve your fastening problems. You can depend upon Townsend to give you excellent service in any quantity. For additional information on the economy of using Townsend tapping screws, send the coupon below or write.

Townsend
COMPANY • ESTABLISHED 1916
1000 SOUTH MAIN STREET
PORTLAND, MAINE

Sales Offices in Principal Cities
Cleveland, Ohio, New York, Chicago, etc.

In Canada: Foremaster & Bullock Manufacturing Company, Ltd., Downsview, Ontario

TOWNSEND COMPANY
Sales Department
New Britain, Pa.

Name Title

Company

Street

City Zone State

Please send us no initial charges. Tapping Screw Bulletin T-100



from initial design...



through production line...
SMITH-MORRIS all the way

Retractable AIR INTAKE SCREEN

Specifically designed and manufactured for axial flow compressor gas turbines... Hydraulic actuation system controlled within the screen housing... Small difference in AM standards and aircraft quality bridged.



SMITH-MORRIS CORPORATION
PRECISION AIRCRAFT COMPONENTS
FERNDALE 20, MICHIGAN

subsequent experience with other aircraft has shown that both of these figures may have been optimistic. These weights were estimated for the design:

- Empty weight, 2,450 lb.
- Pilot weight, 150 lb.
- Landing weight, 1,600 lb.
- Fuel weight, 500 lb.
- Initial approximate flight weight, 1,900 lb.
- Transverse rockets, 600 lb.
- Tow-off weight, 2,500 lb.
- Windtunnel Tests-NACA built a small model and tested it in "the Long key model supersonic tunnel," a blow-down type with a test section about 5 in. square. The tunnel is a device from the number of high-Mach can measure flow, variable density, tunnels now available less than 10 years later, but for those days it was a big deal.

The tunnel was without a direct, considerable condensation appeared to varying degree during the test runs and could not be converted out in the test results.

Drag data showed considerable scatter because of air surface system present, turbulence introduced by condensation, and the existence of a tunnel drag of the model. But careful checking with theory and some hand thinking convinced the NACA that the drag values for the body alone probably were within 10% of the correct value.

The complete model with wings and tail was a different story, and the NACA says that the significance of these drag results was doubtful.

Interference in model construction were blamed for some of the poor drag data; handling and buffeting during wind tunnel testing made measurement of the model's sharp leading edges a difficult job.

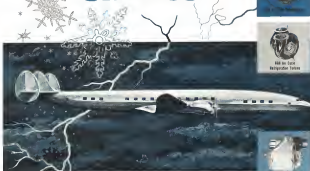
Even though the drag results were unsatisfactory, NACA believed that lift and moment data were significant.

► **Performance Estimates**—Using a combination of test results and theory, total drag coefficients were calculated for the airplane design. On the basis of those figures, the performance was calculated. One example: For a Mach number of 1.45 at a flight altitude of 35,000 ft, the fuel consumption was 1.34 lb. per sec. This corresponds to a fuel economy of about 1.2 miles per gallon, a figure not too far removed from that achieved with high-horsepower, contemporary automobile with hydraulic transmission.

► **What Did They Learn?**—The airplane was never built or carried very far beyond the analytical stage, but nevertheless it furnished much valuable information.

It pointed out the lack of certain data and the need for making up the deficiencies, it suggested the value of the range engine for supersonic propulsion.

Climate Custom-Made by **STRATOS**



With Stratos equipment aboard, cabin pressure and temperature stay being problems to the crew. Cabin climate is automatically maintained, regardless of engine or airplane speed, outside temperature or altitude of flight.

Stratos cabin superchargers and their matching axial-flow refrigeration turbines are demonstrating superior operating performance with an outstanding service record. Apparent service periods exceed the rated engine overhaul periods.



STRATOS

A DIVISION OF FARMING LANSING & AIRPLANE CORP.
Main Office: Bay Street, E. 11, N. Y. • West Coast Office: 1213 Wilshire Blvd., Los Angeles, Calif.

TYPICAL
STRATOS PRODUCTS



Steel that puts on a coat to take a bath

Timken's new steel pump works thousands of feet under ground where no one can see it. Yet it wears a costly coat of gleaming chrome-plated—vital protection against abrasive sand and gas and highly corrosive chemicals in the run oil. This manufacturer was having trouble getting the chrome to stay on. One out

of every five plungers had to be rejected. The trouble was abrasive surface defects on the steel he was using.

Timken Company metallurgists were called in. They recommended a certain analysis of Timken steels, noting that had the special qualities needed for this application.

The Timken steel proved to be the answer to this problem. It took five chrome-plating problems and one day to get the solution. Complete pump rolled off the assembly line without any production delays.

The files at the Timken Company contain records of hundreds of problems like this, solved by Timken sales. Next time you have a tough steel problem, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 4, Ohio. Look address "Timkenco." Exported Roller Bearings, Alloy Steel and Stainless Tubing, Bransford Rock Site.

TIMKEN
Fin Alloy
STEEL
BARS, SHAFTS, SEAMLESS TUBING
AND GRAINITE TOOL STEELS

of every five plungers had to be rejected, the NACA report had this to say about the configuration.

The successful operation of the apparatus cannot remain theoretical, it depends on large increase in the design extent of low-pressure heat transfer for adding heat to relatively high velocity air stream. Basic research therefore appears to be urgently needed. The present study has indicated that all heat exchanger design systems will generally require further capable of operating with low higher rates.

Efforts should be made to develop reasonable geometry definition that will permit application to various configurations over a wide range of entrance Mach number.

Fundamental theoretical and experimental research should be carried out to determine the effects of boundary-layer and shock interaction on the aerodynamic characteristics of super sonic bodies and lifting surfaces.

Continued analysis of other possible configurations should be made with a view toward obtaining larger gains.

As of today, the first three of these recommendations for research have been acted upon. Considerable work has been done both in NACA and in industry in connection with high-speed aerodynamic designs (Aeronautics Week June 28, p. 30, July 12, p. 25) and missile research.

The fourth suggestion—configuration choice for longer range for the engine—has not been neglected in this country, with the exception of studies for non-carrying missiles. The work now carrying comprehensive airplanes now being set in France, the work of Lofgren and his colleagues.

Researcher III never flew, but it left its mark on the design of aircraft and missiles that followed after.

Transparent Molds Aid Casting Studies

The fluid mechanics of casting processes is being studied in the General Motors Research Laboratories with transparent models of molds.

The project began when GM scientists wanted to cast test bars of uniform quality in the development of GMR-135, a high-temperature jet engine alloy selected by the company's future work.

They found that the quality of the test bars was not uniform, and the physical properties of the cast bars were not uniformly indicated.

Water is used with the castable transparent mold to visualize the solidifying process. High-speed photography does the pouring action for subsequent analysis of the fluid flow, and show

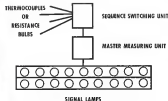


I NEED A GOOD TEMPERATURE MONITORING SYSTEM.

TAKE A LOOK AT THERMO ELECTRIC'S



Thermo Electric's temperature monitoring system is composed of well-tested, standardized units. Each system consists of 4 basic parts:



The signal lamps indicate the condition at each measuring point as it is scanned. The master measuring unit can be pre-set easily to operate signal lamps at the high or low point you want. If the temperature is normal, a green light flashes—but if the temperature passes the danger-point you set, a red light goes on and an audible alarm is sounded. The alarm can be silenced by pressing a button, but the red light stays on until temperature returns to normal.

Different temperature monitoring systems can be built-up from standard units. Each Thermo Electric system can handle up to several hundred thermocouples (or resistance bulbs). Additional systems can be installed for greater capacity, or for high-speed scanning, or for monitoring various temperature points independently of one another.

Interested? Write for Bulletin 70—C

Products • Thermocouples • Precision Tubes • Quick-Coupling Connectors
Bismuth and Selenium Wires • Resistance Bulbs • Connector Panels

Thermo Electric Co., Inc.
SADDLE RIVER TOWNSHIP, ROCHELLE PARK POST OFFICE, NEW JERSEY
IN CANADA—THERMO ELECTRIC (Canada) Ltd., BRAMPTON, ONTARIO

LOCKHEED
AIRCRAFT CORPORATION
is located only
8 MILES from
ATLANTA
GEORGIA

Where You Can Find

- 132 Parks and Recreational Areas
- 17 Hospitals
- 29 Colleges
- More than 400 Churches

LOCKHEED
NEEDS
AIRCRAFT ENGINEERS

- STRUCTURES**
- DYNAMICS
 - WEIGHTS
 - DESIGN
 - PRODUCTION DESIGN
 - SERVICE MANUALS
 - PRODUCTION DESIGN
 - REPAIRS
 - ENGINEERING DRAWING
 - INSPECTION

Here at Lockheed, in Marietta, Georgia, a long range program of activities at 843 2nd Avenue and C-130 A Tube Prop Cargo plane, plus a new multi-engine aircraft in 8-40 ft. fuselage in service, lets you get in on the ground floor where opportunity is abundant. Air is and always will be excellent living conditions as to climate, cultural, educational, and recreational about you — and Lockheed is a name that means progress, quality and stability in the business world. Come to the Aerospace Sound Booth.

WRITE REPT. AFTER
LOCKHEED AIRCRAFT CORP.
7777 Peachtree Dr., N.E.
Atlanta, Georgia

and tell us where we can contact you with further information



GEORGIA DIVISION
MARIETTA, GEORGIA

ry new factors in turbulence in the field, triggered air and space database (see the box).

CMI's conclusion: Such studies can point the way to vast improvement of casting quality.

**Scholarship Grants
Set Up for Air Study**

Announcements of three grants for General and to student engineers have been made recently.

• **Martin Aeronautical Student Fund**, part of an original endowment of \$250,000 given to the Institute of the Aeronautical Sciences in 1942 by Glenn L. Martin. Then extended for establishing an aeronautical research laboratory, the fund has now been made available for ailing students, of which one is student and.

Administration of the earnings of the fund will be handled by an advisory board including Martin, T. P. Wright,

superintendent for research at Case Western Reserve University, and the president and director of the Institute.

• **IAS Fellowship in Flight Test Engineering**, given by an anonymous donor, to cover two years of graduate research work, when an appropriate exception has been established. A Board of Award has been appointed, consisting of Dr. H. J. Dryden, NACA director, Roger W. Kahn of Convair and S. Paul Johnston, IAS director. First recipient of the award is David G. Powell, 1964 Princeton graduate, who will return to Princeton for postgraduate work after a semester working at Douglas El Segundo.

• **Learna Strohoff scholarships**, established at Mississippi State College by Michael Strohoff, president of Strohoff Aircraft Corp. These scholarships are to be administered by the university's engineering department to encourage originality in research needed students of engineering, mathematics and the physical sciences.



V-2 Blows Up on Stand

Accidental detonation of the explosives used to separate autostraps and without from the body of this V-2 rocket destroyed it on the firing stand. Rocket was loaded 95, as signed by the V-2 Upper Atmosphere Fund at the Naval research laboratory and set for firing on June 14, 1951. Normal operations by explosive detonation of four structural members in the control compartment is made before re-entry into the atmosphere

on the descending leg of the trajectory, at an altitude around 50 mi. From parachute are visible and have high drag, giving them a very much slower rate of descent in the ground and among the recovery problem. Rocket was part of a small V-2 firing program conducted by General Electric's Project Hermes in cooperation with government and scientific agencies. This picture has only recently been made available.

WHY IT PAYS TO BUY COLD FINISHED BARS FROM US



**You get the best bar
for the job**

• Our experienced technical staff will help you determine what grade of cold finished bar would best help out costs in your shop. Often, you can realize great savings by not over-buying quality. . . . the best bar for the job is not necessarily the most expensive.

The large ready-to-ship stocks in all our warehouses insure a wide variety of types in the sizes and shapes most commonly used. These cold finished bars are produced on

der exacting quality control by the world's foremost steel manufacturer — United States Steel.

When you want the best in cold finished bars, combined with sound technical assistance and prompt delivery, call your nearest U. S. Steel Supply warehouse. We carry cold finished rounds, squares, hexagons flats and precision shanking in all grades, cold finished screw stock, Reserve rounds, "MX" high speed screw stock.

**TRIPLE
SECURITY**

**What you want
When you want it
At the right price**

U. S. STEEL SUPPLY

DIVISION

General Office
328 So. La Salle St., Chicago 6, Ill.



Warehouse and Sales Offices
Coast to Coast



UNITED STATES STEEL



WHERE HEAT IS 1000°+...IT'S ENDURO

ENDURO is made for flight. Jet aircraft flight. Where heat is intense. Republic Enduro Stainless and Heat-Treating Steels stand up to temperatures that defeat less able metals. Enduro tailpipes, tail cones and afterburners take 1000° plus operating temperatures in stride. Never weakening, never losing dimensional stability. Enduro can heat and lower it!

There's more. ENDURO resists heat-induced corrosion. Resists rust. Resists the effects of sea water atmospheres. Is easy to fabricate, even in

the intricate shapes and convolutions today's jet engines demand.

Republic Enduro Stainless and Heat-Treating Steels have ticked many past aircraft problems, are destined to tick away future ones. Republic metallurgists are study now to help you use Enduro to best advantage. Just ask:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Mansfield, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
 Export Department: Chrysler Building, New York 17, New York

REPUBLIC
ENDURO STAINLESS STEEL



Other Republic Products include Carbon and Alloy Steels — Titanium — Pipe, Sheets, Strip, Bars, Wire, Pig Iron, Casts and Mold, Telling

PRODUCTION



JET MOTOR FORGING is scanned in turntable (foreground) before immersion in tank (left, not) for ultrasonic scanning. Electronic console is at right.

Tape Guides Ultrasonic Inspector

Allison gets first Sperry Simac tester for automatic assembly-line inspection of turbojet engine parts.

Sperry Products, Inc., has developed a new automatic, assembly-line inspection instrument that finds defects in metal engine and turbine components by scanning ultrasonic waves through the part.

An offshoot of Sperry's Reflectoscope, the new non-destructive tester combines the principles of high-frequency sound inspection and automatic programming of operators in series of punched tape.

Part of the new inspection measurement and control device (Simac) has been tested and accepted at Sperry's Dearborn, Conn., plant by General Motors Corp.'s Allison Division for checking turbojet water bearings and other turbojet engine components.

The instrument now is undergoing performance tests at Allison's Indianapolis factory, where the quality control department plans to use Simac on a 24-hr-a-day basis.

Cost of engineering and building the prototype totaled \$500,000, Sperry officials report. They say the device will be put on the commercial market soon at a set-underestimated price or made available for lease.

The Simac installation is made up of three main parts.

• **Setup table.** Each engine or turbine part is prepositioned on a portable turntable by a series of set screws and endstops, assuring proper alignment of the test piece during measurements.

• **Scanner and test piece.** The scanner is a water-filled tank that encloses the part and the scanning head, a quartz crystal transducer capable of transmitting 5 million vibrations per second through the piece undergoing inspection. Water serves as an efficient conductor of ultrasonic waves between the scanner and the test piece.

The scanner and its electronically controlled motor are supported over the tank on a horizontally moving carriage. The search head is guided by a second smaller carriage that moves vertically, allowing the test part to be completely checked in an automatic sequence of horizontal, vertical and angular positions on the turntable setting.

• **Readout.** All defects, indicated by echo signals, are recorded by a rotating table that holds a 28-in.-diameter paper chart, a pen and also positioner.

• **Control cabinet.** This unit, controlled by Sperry's "brain" of the installation, houses all electronic components for operating the positioning devices. It also coordinates these activities through a parallel tape that controls a servomotor, which rocks out one of a possible 4,096 positions.

• **Electronic console.** The operator controls the scanner manually or starts automatic tests from this operator's center. He observes the complete test or any critical part of it, console on the face of a console unit that displays all ultrasonic echo signals. The console incorporates a Reflectoscope as a basic part of the system.

Sperry engineers say Simac will test Allison's jet engine forgings thoroughly in 15 min. For larger parts, the machine can be programmed by tape for two hours of continuous and automatic method.

The ultrasonic waves are transmitted to both the test piece and the front operator, the company reports.

Sperry Products, Inc., Dearborn, Conn.

PRODUCTION BRIEFING

• **Continental Motors Corp.** has activated a New Products Division at 2647 London Ave., Detroit, Mich., to handle research and development projects. Lt. Gen. Ray C. Hickey (USA Ret.) has been named manager of the division and is executive vice president of the company.

• **Link Aircraft Corp., Englewood, N. Y.**, has purchased design, manufacturing and sales rights in Lockheed Aircraft Services' installation of the Cessation Wilgen business plane to take 260 hp in scanning engines in place of the current 200-hp Rengum. Link also secured work fabrication loading and a complete overhaul of Wilgen components left.

• **Leocom Devision of Aero Mfg. Corp., Stoughton, Conn.**, has received an Air contract for Wright-designed R3300 piston engines. Total order totals \$1.5 million.

• **Sola Aircraft Co., San Diego, Calif.**, has received a large order from Lockheed Aircraft Corp. for Man gas turbine-powered generator sets to be used on USNAT transport Super Constellation. The contract, Lockheed order plus subsequent additional contracts for spare parts, total about \$1 million. Other Sola sales firms has opened a European branch office in London, England, which will handle machine leasing business for Sola products abroad and foreign engineering consulting British products in the USA.

• **Fletcher Aviation Corp., Pasadena, Calif.**, has developed a high-speed lift-off automatic, welding machine, the Electron, which is aimed to melt no dissolving radiation to interfere with nearby radio and television sets. Fletcher is expanding its space with a new 116,000 sq. ft. plant at Buena Vista Airport, adjoining Pasadena.

• **Alphagray Lathum Steel Corp.** has expanded facilities at its Perreelle (Detroit suburb) plant which makes the company an integrated prime producer of reinforced carbon for tool and die

Hecker



TOOL ENGINEERING

For many years Hecker has engaged in aircraft engine planning and tool designing. Our large expert staff is prepared to serve your company either in your plant or in our own. We solve your problems and will be pleased to send further information.

Designers and Builders
Tool • Jigs • Fixtures • Special Machinery

Manufacturers of Machine Metal Parts

HECKER TOOL
A.W. Hecker CO.
7200 RUCIAD AVENUE
CLEVELAND 3, OHIO

applications. Flow space at the plant has been increased by 300% and the firm is now making all of its own carbide powder.

• Cooper Alloy Foundry Co., Millville, N. J., has expanded capacity for ELG-type extra low-carbon stainless steel by more than six times of melted metal daily.

• Econ Products Co., a wholly owned

subsidiary of Electronic Engineering Co., has been founded incorporated to manufacture electronic plug-in units, ruggedized electronic computers and other products.

• Boyar-Schultz Corp., maker of machine tools, grinders and special machinery, is completing a building at 2000 25th Ave., Brookline, Ill., which will provide 71,000 sq. ft. of area, a 30% increase over its present quarters.

NEW AVIATION PRODUCTS



TEMPLATE Jigger left on grinder

New Template Simplifies, Speeds Angle Grinding

A new template simplifies and speeds right angle grinding on turning tools by eliminating the need for disassembled attachments, progressive drawings and calculations to refine the true face of a cutting edge, according to Niles-Bement Co.'s Pratt & Whitney Division.

The manufacturer says its Stock R Dialing wheel turning attachment operates this way:

- Template is mounted on a corner with graduated scales and tilted to the angle at both the end and side and held.
- The corner also is pivoted out to the desired angle of side relief.
- The grinding wheel is then fed by moving the wheel bar over the template's profile.
- Photograph mechanism transmits the turner's path to the turning demands at a five to one or 10 to one reduction ratio.

Pratt & Whitney Division, Niles-Bement Road Co., West Hartford 1, Conn.

Portable Power Supply For Preflight Testing

Heavy-duty ground power supply for preflight testing or portable repair, such as rated at 48 kw, 0.75 power factor, with 100% overload capacity.

The manufacturer claims a novel feature is use of a small 400-cycle induc-

tor alternator as an exciter, and electronic rectifier which senses 48 kw output and regulates the induction alternator accordingly. This is said to provide 0.1-second no-load to full-load recovery time, less than 10% voltage overshoot, and freedom from maintenance, as a result of elimination of rotating machinery, brushes, springs, etc., in the induction alternator.

Frequency of the 48 kw alternator is 600 cps, plus or minus 10%, no load to full load; maximum harmonic content is less than 2.5; 5 phase output is 230/208 v; supply frequency lines are 220/440-v, 3 phase, 60 Hz.

The portable ground power supply is mounted on generator rubber wheels. It is equipped with an input cable, two output cables, frequency and voltage protective relays and a full set of instruments and controls mounted in a panel.

Aeromarine Electric Motors, Inc., 451 Telegraph Road, Los Angeles 22, Calif.



STOP attachment for turret lathes.

Precision Lathe Stop Holds Dimensions to .001 in.

New stop attachment for turret lathes is guaranteed to hold to .001 in. on any linear dimension from face out to steps and grooves. It is said to assure faster setups, save time between shifts, and is to be exceptionally fast and accurate on rounds.

The stop attaches easily to the nose bar stop of Warner Swasey, Cobalt, M&M, and other turret lathes having multiple stop rail. It is made of chrome-plated, case-hardened steel. It

Announcement

THE CONNECTICUT HARD RUBBER COMPANY
IS PROUD TO ANNOUNCE COMMERCIAL
PRODUCTION OF ITS NEWEST DEVELOPMENT...

HIGH STRENGTH, HIGH TEAR RESISTANCE
SILICONE RUBBER

CONRLASTIC M-T®*

Silicone Rubber now comes of age!

Conrlastic M-T combines the mechanical properties associated with other synthetic rubbers with the excellent temperature and electrical characteristics of the silicones.

This development, made by our chemists and engineers, is so outstanding that many users of rubber will wish to investigate its application to their specific problems. The properties now available in CONRLASTIC M-T are:

- HIGH TENSILE STRENGTH — up to 2,000 pounds
- HIGH TEAR RESISTANCE — equal to most rubber compounds
- BURN RESISTANCE — up to 400° centigrade
- EXTREME LOW TEMPERATURE RESISTANCE
- RESISTANCE TO OILS, CHEMICALS AND SOLVENTS
- EXCELLENT ELECTRICAL PROPERTIES
- EXCELLENT OZONE AND DEGRADATION RESISTANCE

FURTHER DETAILS ON REQUEST — WRITE TO

Connecticut
HARD RUBBER COMPANY
414 EAST STREET, NEW HAVEN, CONNECTICUT

*Trademark registered
Patents applied for

Whatever the job... PERMACEL TAPE



IT'S STIPULY QUIET IN THE LUXURIOUS DOUGLAS DC-7.

AS PLEASANT AS A QUIET EVENING AT HOME...



VIOLATION NOTICE IS LESS FREQUENT PERMACEL'S Sound Hanging Tape is at work in the quiet vibration-free cabin.



QUICKLY AND EASILY, PERMACEL'S Sound Hanging Tape is permanently applied to the interior panels of the plane.

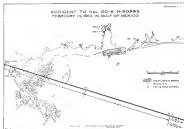


IN ANY METAL PANELS, sound is deadened by this tape. Permacel Tape made of aluminum foil laminated in cloth.

SELF-STICKING PERMACEL TAPES

In our complete line, there's a self-sticking tape for every job... write Permacel Tape Corporation, New Brunswick, N.J.

AVIATION SAFETY



CAB Accident Investigation Report on NAL Crash

Turbulence Downed DC-6 in Gulf

1988 ACCIDENT

National Airlines Flight No. 479, a DC-6, N 9088, was last seen at 4:40 p.m. about off Mobile Bay, Ala., at about 1715. Seventeen bodies and light parts of the aircraft fuselage were recovered the following day. It was not until May 30 that a part of the aircraft fuselage was recovered. Subsequently, approximately 75% of the wreckage was located and saved.

HISTORY OF THE FLIGHT

Flight 479 originated at Miami, Fla., for New Orleans, La., with one stop scheduled at Tampa, Fla. Capt. Ernest Sprague, First Officer L. J. Stribling, Flight Engineer Edward Gonzalez, and Stewardess E. Stewardess and E. Stewardess comprised the crew.

Both pilots reviewed the weather situation at the captain's Miami Flight Control office. The weather data consisted of U.S. Weather Bureau sequence number reports, upper air winds and reported turbulence. The company's flight report number showed the reported weather conditions. All reports, pertinent weather data were attached to the flight's document.

From Miami the flight was uneventful, with departure at 1415, and according to Visual Flight Rules with the Tampa landing at 1515. Both pilots went to the crew part of the flight report office, where the flight plan was reviewed by New Orleans. Additional weather information was available the 1988 sequence report indicating flight at New Orleans and indicate about

1415 (this report was 015). National Airlines had a direct telephone call to the U.S. Weather Bureau, approximately 10:00 a.m. on May 30. The Miami New Orleans Stewardess advised

the Gulf Coast, was attached to the crew. Fuel was added, bringing the total to 2,100 gal. Seventeen passengers boarded at Tampa and three more 24 through passengers, making a total of 41, and two more crewmen. Upon departure, at 1445, the aircraft's gross weight was 75,500 lb., or 11,425 lb. less than the maximum of 86,925 lb. and its center of gravity was located within approved limits.

Aviation National Flight No. 917, also a DC-6, had left Tampa for New Orleans at 1441. At 1515, 10 minutes before the departure of Flight 479 National's Flight Control at Miami sent Radio-New Orleans this message: "445 Capt. NAL to give us picture of flying conditions on field over New Orleans. Stop. If not of category give to Flight 479, acknowledge."

There are three pictures showing parts over the Gulf of Mexico between Tampa and New Orleans, all obtained by radio. They are, from left to right, NAL 145 radio from Tampa, NAL 151 radio from NAL, and NAL 115 radio from NAL.

At 1515, Flight 479 departed Tampa at 1515. Its flight plan filed previously at Miami, reported a cruising altitude of 14,000 ft. according to Instrument Flight Rules and an estimated descent time of two hours for the direct 450 statute miles to New Orleans. Based on the weather data attached to the captain's copy of the flight plan was a forecast of thunder storms attended by moderate to severe turbulence in the vicinity of New Orleans. The Captain, Capt. Stribling, advised the flight at the 14,000 ft. level down to New Orleans.

Flight 479 passed over NAL at its cruising altitude of 14,000 ft. at 1515, and on May NAL at 1642 and to respond to

Radio-Tampa one minute later. At that time the flight also gave the flight marker looking down at 4,500 ft., looking down at 13,000 ft. and temperature 4°C. Meanwhile, Flight 917 landed at New Orleans at 1613. It was the crew at 1617 and at 1615, it captured sent the following message to Miami Flight Control and to all company stations between New Orleans and Jacksonville, Fla.: "including Pensacola, Fla." Flight 917 advised extreme turbulence at all altitudes just east of New Orleans. At 1620, the captain sent the following message to the same stations: "Ref. extreme turbulence conditions stop at present time severe turbulence No 1 check [NAL] to New Orleans weather looks better to west of New Orleans."

At 1640, Flight 479 requested pricing over NAL at 1645 at 14,000 ft., and estimated time over NAL at 1715. It also reported, "Thunderstorms all road, touch." "Pensacola was received and acknowledged, this message, and advised the flight of severe turbulence" between NAL and New Orleans as reported by Flight 917. Flight 479 acknowledged, asked what altitude Flight 917 acquired turbulence, and was advised "severe turbulence at all altitudes." Again Flight 479 acknowledged.

At 1645, the flight advised Pensacola that it was entering power because of turbulence and low altitude later reported as Radio Traffic Control clearance to descend from 14,000 ft. to 4,500 ft. This was quoted within a minute or so, with the position that descent between 1640 ft. and 1650 ft. in visual. At 1711, the flight advised Pensacola of pricing through 10,000 ft. and at 1712, increased, advised that it had reached 4,500 ft. at 1713. Pensacola reported this message back to the flight and gave it the 3045 New Orleans special weather. This was measured 800, overcast, visibility 10 miles, with northwesterly 15 mph, and gusts to 15. At 1715, the altitudes 20-61 barometer readings. The flight asked to be heard and there were no further radio messages.

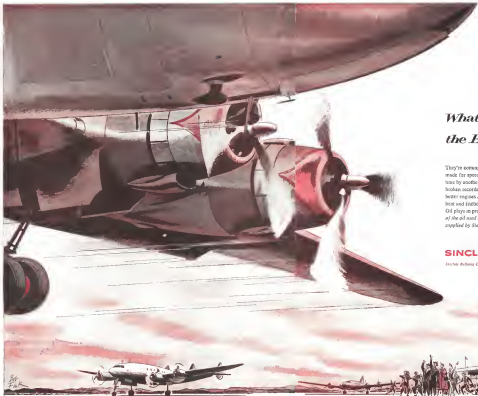
An attempt by New Orleans at 1715 to contact Flight 479 was unsuccessful, as were subsequent attempts by several other stations and at 18:00 the Gulf Coast's main radio service was stopped.

Low clouds and heavy rain thinned the search both in air and on the ground. On the afternoon of May 30, 1715, the flight and 17 bodies were recovered from a field located near the Gulf of Mexico at about 10° 15' North Latitude and 87° 05' West longitude. This position is approximately 15 miles to the right of the aircraft's direct route and is about 25 miles northwest of the crash site. The flight plan of Mobile Bay. Two-way radios on bodies were reported stopped at 1518 (1715).

INVESTIGATION PART I-GENERAL

The flying device that was recovered the day following the accident was carefully examined. The wreckage consisted of baggage, personal belongings, and numerous discarded food and first-aid supplies and supplies from all sections of the cabin. The wreckage was found in small pieces, such as the extreme deterioration of a body's neck support when a further piece of material, which was found, was not been part of the wreckage.

Each of the search areas were



What's behind the Broken Records?

They're coming so fast now they hardly make news. Records are made for speed, height, capacity — then smashed in short time by another power, bigger commercial surface. Back of these broken records is lower power — developed by ever greater, better engines... engines that must be protected against damaging heat and friction. Sinclair is proud of the part its Aircraft Oil plays in protecting these engines. Today, more than 45% of the oil used by major scheduled airlines in the U. S. is applied by Sinclair... Proof positive of dependability.

SINCLAIR AIRCRAFT OILS

Sinclair Refining Company, American Sales, 100 Fifth Avenue, New York 20, N. Y.

The most complete line of AIRCRAFT INVERTERS



The Red Bank Division of Bendix Aviation Corporation is the largest plant in the world devoted to aircraft inverter units—and for three significant reasons. First, we offer the widest range of inverters. Second, we design and build each inverter as a complete, unitized mechanism. Third, we are equipped to design and produce inverters for all kinds of special purpose applications. And, in fact, we are now engaged in developing new inverters up to 5000 VA and for high rpm, jet engines, high altitude applications. Our current production models are described below. For complete details on these and also on special-purpose designs, write: Aircraft Inverter Section, Bendix Red Bank Division, Batavia, N. Y.

INVERTERS—400 CYCLE OUTPUT

Type Number	INPUT			OUTPUT			Aircraft Weight Limit	Max. AC Power	Delivered to Load (Watt)
	Volt	Amper	Watt	Volt	Power Factor	Watt			
12-10	28	—	—	28	1	1000	1000	1000	1000
12-11	28	—	—	28	1	1000	1000	1000	1000
12-12	28	—	—	28	1	1000	1000	1000	1000
12-13	28	—	—	28	1	1000	1000	1000	1000
12-14	28	—	—	28	1	1000	1000	1000	1000
12-15	28	—	—	28	1	1000	1000	1000	1000
12-16	28	—	—	28	1	1000	1000	1000	1000
12-17	28	—	—	28	1	1000	1000	1000	1000
12-18	28	—	—	28	1	1000	1000	1000	1000
12-19	28	—	—	28	1	1000	1000	1000	1000
12-20	28	—	—	28	1	1000	1000	1000	1000
12-21	28	—	—	28	1	1000	1000	1000	1000
12-22	28	—	—	28	1	1000	1000	1000	1000
12-23	28	—	—	28	1	1000	1000	1000	1000
12-24	28	—	—	28	1	1000	1000	1000	1000
12-25	28	—	—	28	1	1000	1000	1000	1000
12-26	28	—	—	28	1	1000	1000	1000	1000
12-27	28	—	—	28	1	1000	1000	1000	1000
12-28	28	—	—	28	1	1000	1000	1000	1000
12-29	28	—	—	28	1	1000	1000	1000	1000
12-30	28	—	—	28	1	1000	1000	1000	1000
12-31	28	—	—	28	1	1000	1000	1000	1000
12-32	28	—	—	28	1	1000	1000	1000	1000
12-33	28	—	—	28	1	1000	1000	1000	1000
12-34	28	—	—	28	1	1000	1000	1000	1000
12-35	28	—	—	28	1	1000	1000	1000	1000
12-36	28	—	—	28	1	1000	1000	1000	1000
12-37	28	—	—	28	1	1000	1000	1000	1000
12-38	28	—	—	28	1	1000	1000	1000	1000
12-39	28	—	—	28	1	1000	1000	1000	1000
12-40	28	—	—	28	1	1000	1000	1000	1000
12-41	28	—	—	28	1	1000	1000	1000	1000
12-42	28	—	—	28	1	1000	1000	1000	1000
12-43	28	—	—	28	1	1000	1000	1000	1000
12-44	28	—	—	28	1	1000	1000	1000	1000
12-45	28	—	—	28	1	1000	1000	1000	1000
12-46	28	—	—	28	1	1000	1000	1000	1000
12-47	28	—	—	28	1	1000	1000	1000	1000
12-48	28	—	—	28	1	1000	1000	1000	1000
12-49	28	—	—	28	1	1000	1000	1000	1000
12-50	28	—	—	28	1	1000	1000	1000	1000
12-51	28	—	—	28	1	1000	1000	1000	1000
12-52	28	—	—	28	1	1000	1000	1000	1000
12-53	28	—	—	28	1	1000	1000	1000	1000
12-54	28	—	—	28	1	1000	1000	1000	1000
12-55	28	—	—	28	1	1000	1000	1000	1000
12-56	28	—	—	28	1	1000	1000	1000	1000
12-57	28	—	—	28	1	1000	1000	1000	1000
12-58	28	—	—	28	1	1000	1000	1000	1000
12-59	28	—	—	28	1	1000	1000	1000	1000
12-60	28	—	—	28	1	1000	1000	1000	1000
12-61	28	—	—	28	1	1000	1000	1000	1000
12-62	28	—	—	28	1	1000	1000	1000	1000
12-63	28	—	—	28	1	1000	1000	1000	1000
12-64	28	—	—	28	1	1000	1000	1000	1000
12-65	28	—	—	28	1	1000	1000	1000	1000
12-66	28	—	—	28	1	1000	1000	1000	1000
12-67	28	—	—	28	1	1000	1000	1000	1000
12-68	28	—	—	28	1	1000	1000	1000	1000
12-69	28	—	—	28	1	1000	1000	1000	1000
12-70	28	—	—	28	1	1000	1000	1000	1000
12-71	28	—	—	28	1	1000	1000	1000	1000
12-72	28	—	—	28	1	1000	1000	1000	1000
12-73	28	—	—	28	1	1000	1000	1000	1000
12-74	28	—	—	28	1	1000	1000	1000	1000
12-75	28	—	—	28	1	1000	1000	1000	1000
12-76	28	—	—	28	1	1000	1000	1000	1000
12-77	28	—	—	28	1	1000	1000	1000	1000
12-78	28	—	—	28	1	1000	1000	1000	1000
12-79	28	—	—	28	1	1000	1000	1000	1000
12-80	28	—	—	28	1	1000	1000	1000	1000
12-81	28	—	—	28	1	1000	1000	1000	1000
12-82	28	—	—	28	1	1000	1000	1000	1000
12-83	28	—	—	28	1	1000	1000	1000	1000
12-84	28	—	—	28	1	1000	1000	1000	1000
12-85	28	—	—	28	1	1000	1000	1000	1000
12-86	28	—	—	28	1	1000	1000	1000	1000
12-87	28	—	—	28	1	1000	1000	1000	1000
12-88	28	—	—	28	1	1000	1000	1000	1000
12-89	28	—	—	28	1	1000	1000	1000	1000
12-90	28	—	—	28	1	1000	1000	1000	1000
12-91	28	—	—	28	1	1000	1000	1000	1000
12-92	28	—	—	28	1	1000	1000	1000	1000
12-93	28	—	—	28	1	1000	1000	1000	1000
12-94	28	—	—	28	1	1000	1000	1000	1000
12-95	28	—	—	28	1	1000	1000	1000	1000
12-96	28	—	—	28	1	1000	1000	1000	1000
12-97	28	—	—	28	1	1000	1000	1000	1000
12-98	28	—	—	28	1	1000	1000	1000	1000
12-99	28	—	—	28	1	1000	1000	1000	1000
12-100	28	—	—	28	1	1000	1000	1000	1000

NOTE: AC output voltage (RMS) is a nominal value of 27.5 volts. AC output is designed to operate both 28 and 27 volt loads within these limits at 115° and 125°.

Manufactured at Special Purpose Electric Plant, Batavia, New York, Division of Bendix Red Bank Division.



BATAVIA, N. Y.

Write Direct and Specify: 117 E. Broadway, New York City 100, N. Y. 10003

Specify Make, Model, International Number, 314 One Star is New York, N. Y. 10003

Contact on Bendix: Airline Product Sales, P.O. Box 4700, Batavia, N. Y.

section of the left wing joined to Station 130 to Station 186 was recovered in a case suitably intact. It was broken, torn and pitted in such a manner that there could not have remained any bearing or to contribute to the structure. The section was in place in this section for the entire length. The front part of the wing was to approximately Station 450. The case was in place from Station 200 out to Station 411.

The upper portion of this case was found to be twisted severe hydraulic damage for its entire length, and those sections of the front and rear wing were found damaged. The left wing was still attached to the rear of the aircraft and the right wing was still attached to the front of the aircraft. The left wing was found to be twisted severe damage to the rear of the aircraft. The right wing was found to be twisted severe damage to the front of the aircraft. The left wing was found to be twisted severe damage to the rear of the aircraft. The right wing was found to be twisted severe damage to the front of the aircraft.

Various pieces of fabric, also attached to the left wing, were found to be twisted severe damage to the rear of the aircraft. The right wing was found to be twisted severe damage to the front of the aircraft. The left wing was found to be twisted severe damage to the rear of the aircraft. The right wing was found to be twisted severe damage to the front of the aircraft.

A close examination of the fuselage at Station 130 on the left wing was made. Since the portion of the wing above the fuselage was twisted severe damage to the rear of the aircraft, the examination was made to the rear of the aircraft.

The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. Further, an examination of the left wing was made. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage.

A large number of instruments, switches and controls from the cockpit were recovered. Most of these were in such a condition that they could not be used. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage.

The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage.

The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage.

All recovered material which was damaged was examined for evidence of failure. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage. The examination disclosed that the twisted portion of the wing had failed to attach to the fuselage.

The damaged to the hydraulic system, electrical system and all other components was so extensive that nothing significant could be determined from these sections. In fact, the only parts that were recovered were the twisted portion of the wing and the twisted portion of the fuselage.

Recovery suit structure, etc. were recovered.

FOR CONTINUOUS NEW PUMP PERFORMANCE and DEPENDABILITY...

SPECIFICATION SHEET

Model No. 070044 Engine driven Dual Bell Pump with 40 gpm @ 5000 psi

Model	Capacity (gpm)	Pressure (psi)	Power (hp)	Weight (lb)	Dimensions (in)
PESCO 24	24	25	1.5	10	10 x 10 x 10
PESCO 30	30	30	2.0	15	15 x 15 x 15
PESCO 40	40	40	2.5	20	20 x 20 x 20
PESCO 50	50	50	3.0	25	25 x 25 x 25
PESCO 60	60	60	3.5	30	30 x 30 x 30
PESCO 70	70	70	4.0	35	35 x 35 x 35
PESCO 80	80	80	4.5	40	40 x 40 x 40
PESCO 90	90	90	5.0	45	45 x 45 x 45
PESCO 100	100	100	5.5	50	50 x 50 x 50



Pesco Model No. 070044 Engine driven Dual Bell Pump with 40 gpm @ 5000 psi. Weight approximately 22.5 lbs.

YOU CAN RELY ON PESCO PUMPS FOR THESE ADVANTAGES:

- DEPENDABLE PERFORMANCE
- LESS INSTALLATION SPACE REQUIRED
- LESS MAINTENANCE

Call or write the Miami Office, Batavia, Ohio for full information on these PESCO products as applied to your specific problem. HYDRAULIC PUMPS • BOOSTER PUMPS • FUEL PUMPS • AIR PUMPS • ELECTRIC MOTORS • POWER PACKAGES



BORG-WARNER CORPORATION
2400 NORTH MIAMI ROAD
MIAMI, FLORIDA 33156



Save 2/3 of your
Wire Twisting Costs
with **ROBINSON**
WIRE TWISTERS

Mixed structures, sub-assembly plants, airlines, military bases, research, and overhead organizations all over the world are now using wiring 3/4 gauge, with the split-second whirling action of the Robtman Wire Twister, in the size required for one by any other method. Savings up to \$140 per gauge are enough to pay for 8 twisters. 3-models-in-1: phor, cutters, twisters. 12" and 9" length \$19.95 ea.—\$18.50 in dia. FOB Sacramento. Unconditionally guaranteed. Write for details.

RALPH C. ROBINSON CO.
Box 494-427
North Sacramento 13, Calif.

"ONE MILLION MILES—SAFELY with
AIRWORK OVERHAULED ENGINES"

says International Remender's Chief Pilot
W. R. Carter and Paul Eassey



The IH fleet averages nearly 200,000 miles a year on Airwork engines—and stays 100% available for service.

Airwork
CORPORATION
Millville, New Jersey
NEW YORK MIAMI WASHINGTON

but an evaluation of these parts deserves an independent audience.

No evidence of helppos. helppos was found in any of the examined freshwater crabs. All of the specimens were of the general 'static type' as defined from the helppos tree.

³No evidence of lee damage or combustible explosive damage was found on any of the recovered wreckage. The wreck was not examined for indications of light rear damage but none was found.

INVESTIGATION
PART III-WEATHER EXPERIENCED
BY NATIONAL FLIGHT NO 907

The capture of Flight 917 testified that when he was approaching New Orleans (between NAL and New Orleans) at his assigned cruising altitude of 4,500 ft., he experienced severe turbulence, coupled with heavy rain and heavy hail. He also testified that the aircraft's instrument panel intermittently shook so violently that the flight instruments were difficult to read.

Another indication of the proper and efficient technique is found in the observed behavior of the individuals who met at the rocket launch. The individuals were well equipped, dressed in well developed, streamlined flight suits, the pants seemed to be more like a pair of leggings, and they wore a hooded back and forth without changing direction of flight. He also stated that most of the passengers became strong swimmers, and that the water was very warm, too, which caused the airplane to drift and skid on one side to the right, and then back to the left, and then "storm." There was very little lightning and there was considerable rain, 1,000 ft. per minute. This airplane also floated that slowly but it was not a very good idea. It was described by some of the men as being approximately 60 miles to the right of the launch, and it was not a very good idea to decrease to get back on the course, and subsequent conversations showed that the aircraft and suggested that the aircraft was not a very good idea. It was not a very good idea to decrease and in the order of 100 miles. This study concerned the

Despite the highly unusual weather conditions as described in the captions of Flight 917, he reported to his company only "extreme turbulence, and loss of power" turbulence between NAL and New Orleans. The last flight therefore reported only the information that there was severe turbulence at all altitudes.

At New Orleans the captain of Flight 917 had the aircraft inspected for possible damage caused by turbulence-induced stresses as had Nage was forced.

INVESTIGATION
PART IV - WITNESSES

Early in the investigation it was believed that Flight 478 was lost in the Gulf of Mexico not far from the mouth of Mobile Bay. Accordingly, statements were taken from a considerable number of persons in that area. There are 16 witness locations; at several of these there was more than one witness. A tanker was at anchor approximately a mile south of the mouth of Mobile Bay because of the heavy weather; statements were taken from 12 of its crew.

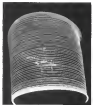
Of the large number of persons, 18 stated that they heard a low flying airplane. One of the 18, a woman, testified as to actually seeing an aircraft at low altitude, but could not identify it as to type. She believed that it was traveling from the southeast toward the southwest. The majority of the 18 persons who claim to have heard an airplane believe that it was traveling from a generally northerly direction to south of the southeast.

The contents of the witness evidence is that it is at about 1718, the time of the accident, weather conditions were at their worst. The wind has been variously estimated as from 50 to 100 mph. A light-house keeper at the mouth of Mobile Bay, accustomed to reporting weather conditions, stated that this wind reached "white gale force," which by definition could mean up to 75 mph. There is some diversity of testimony as to wind direction but the majority opinion is that it changed from easterly to westerly at about 1730.

There is no universality of opinion as to the intensity of pain at the time. Most of the witnesses state that it was "heavy," while others, a relatively short distance away, claim that there was little or no rain. None of the witnesses saw any hail.

One witness who was on the tanker thought that the wind was about 100 mph, and stated that the visibility was as poor that he could barely see half of the ship's length (about 234 ft.). This witness is one of the 14 who claim to have heard a whistle, and he believed it to be as low that he thought it might strike the vessel.

There is no uniformity of opinion as to the cause of the explosion. Some witnesses stated that both were heavy and frequent, while others described heavy



Copter in a 'Cage'

A Korean HUK1 copier, with lights mounted on the tips of one of its nine working arms, produces a striking photograph as it climbs at night: Korean is trying to capture lightning systems for Navy B-2s as possible aids for identification and formation flying. Firm's photographer left his camera shutter open as the HUK1 climbed vertically, fired a flash bulb as the craft got part way up to register it on his film. Heavy lines at bottom of the "caps" controlled while copier hoisted.



SAVED...
66 $\frac{2}{3}$ % in cost,
75% in time—
because

RADIOGRAPHY proved welds sound

Cracks showed up in the shell of this stainless steel sphere. A new one would cost plenty—take priceless time.

But since radiography could prove welds sound and in conformance with code, stainless patches were welded in. The sphere went back to work in one fourth the time and at one third the cost of a

new replacement. This is the way radiography helps extend the use of welding and widen opportunities for welders.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography—

Kodak

TOMORROW'S AIRCRAFT *One step closer*

Putting the finger on unseen aircraft

Unfettered flight and more effective airborne weapons must come from more intelligent airborne systems . . . Air Arm systems.

Typical of such "intelligence" is an Air Arm Defensive (radar controlled turn) system. During "lock-on", its gun dispersion pattern is superior to patterns obtained with the target centered and radar inoperative. Automatic lock-on and search-while-track capabilities for radar, radar-autopilot tie-in and automatic low visibility approach, are other Air Arm solutions to a tomorrow's flight. Already in final flight test stages, they typify the "intelligence" bridging the gap between man and his machine.

Designing and building this "intelligence" is Air Arm's business. A great variety of products and developments—backed by complete engineering, test and production facilities—are daily finding new ways to meet specific airborne requirements.

The ability of Air Arm to combine the most advanced electronic and mechanical state-of-the-art with the greatest measure of reliability is a key to bringing tomorrow's aircraft . . . One Step Closer. 10000

Find out how Air Arm is "Advancing Automatic Flight"

The complete story on how Air Arm serves the Armed Forces and aviation industry has been put into a new book. Ask your Westinghouse salesman or write for B-6372, Westinghouse Electric Corporation, 5 Gateway Center, P.O. Box 644, Pittsburgh 30, Pa.



Jet Propulsion • Airborne Electronics • Aircraft Electrical
Systems and Motors • Wind Tunnels to Rockets

YOU CAN BE **SURE**...IF IT'S
Westinghouse



**These five leading manufacturers
are simplifying production
by ordering major components
from TEMCO.**



TECMCO has proved its ability to produce in the past. Present 1984 schedules for Boeing, Convair, Lockheed, McDonnell, and Republic call for millions of pounds of assemblies and spars. The combined facilities of TECMCO's three plants are capable of producing 20,000,000 pounds per year. But there is more to it than quantity—for TECMCO has established a reputation for building a quality product, on schedule, at one of the lowest costs in the industry.



edge of any thunder or lightning at all, and still others claimed to have heard thunder but saw no lightning. Crew members of the tanker believe that the seas were running about 25 ft. high.

He referred to possible tornadoes, one witness, a commercial fisherman, said there is a lot of talk about a fairly abundant crop of weather, who was at home about eight miles east-southeast of the crash site, stated that he looked out of the north window overlooking the Gulf and saw a tornado extending approximately half way down to the surface from the bottom of the cloud deck which he estimated to be 300 ft. high. Another witness, a man of scientific background, believed that he heard the noise of a tornado (he had heard other tornadoes) but did not see it.

There was scattered property damage throughout the general area west of the mouth of Middle Bay. Some trees were felled and a few structures were damaged. At Crocker-Fort Myer, Va., a U.S. Coast Guard lightship barge sustained three fire pole was bent over. This fire pole was of galvanized steel pipe 3 in. in diam. supporting up to 15 in. of ice. 45 lb. shrapnel passed

and equipped with three 4-in. x 6-in. gas stoves. Two of these were broken and the boat was blown nearly down, heading at the boat. The time was 1700 hours. It took 17 min from the time he first noticed the pole heading until it reached maximum deflection. He estimated the wind velocity to be 35 to 50 mph or greater. There was a No. 10 United States flag flying at the top of the pole. However, the damage was not so extensive as previously caused by fully developed hurricanes.

In this connection it may be pertinent to point out that the development of this storm was similar under surveillance at the Keesler AFB Miss approximately 60 miles east-southeast of the recovered wreckage. The radar manifestation showed that the

data was generally southeast of Kander AFB and lay across the direct route between Taiwan and New Orleans, and that it marked its peak development from 1800 to 1700. The observer on duty stated that the echo was the most intense encountered by him in nearly two years of weather observation on radar scopes at Kander AFB.

A control investigation was conducted of the possibility that the current listed by

* The South "waller" tropical cyclone should not be confused with "typhoons" or "hurricanes." An "extra-tropical cyclone" arises in mid or northern latitudes with an anti-clockwise circulation in the northern hemisphere. A "typhoon" is a closed vortex of small diameter having a flat-topped shape. The central development is a "wall" or "eye" often of very low visibility. A "cyclone" is a general term for tropical or extra-tropical anti-clockwise or clockwise circulation.

⁴For licensing purposes the U. S. Weather Bureau defines moderate and very high winds in its own publication "Volume III Service Generalists Chapter 230 Definition, Remarks" as follows:

† **Wardrobe** Associated with low-level or no-ventilation or no-ventilation (low-level ventilation) and in the vicinity (but not inside) of isolated Quaternary General passages (low-level).

4) *Karuna*. Rice. Usually susceptible to root and shoot blight. May cause occasional damage. (Crops of the above-mentioned Weather Bureau jurisdictions were decimated or affected and air carriers by the Air Transport Line in January 1952.)

As people did not have been Flights 476, Vietnamese examinations were made of the circumstances of all aircraft, both civil and military, in the ground area of the approach. The investigation of the aircraft of the flight 476 DCJ was in this way at about 10:00, the time of the accident. It was by route from Jacksonville, Fla., to Stanley AFB, Pensacola, Fla. The aircraft was a C-130E, and it was very good and was in the best overall condition of ground equipment. The Navy pilot testified that the weather was unusually bad and that he was not able to see the runway. The aircraft was in the above-mentioned area. He was unable to land and subsequently proceeded to, and landed at, Shreveport, La. The flight was made at night. During this flight as the aircraft was in the above-mentioned area, the aircraft was in the area of the accident at 4:00 p.m.

It may be that these witnesses did leave the airplane and later, drawing of an accident, associated it with that accident. It is clear that this Nave plane was some closer than several miles to the accident site. This does not negate the possibility that more distant witnesses did leave the National DC 6.

INVESTIGATION

PART V.—WEATHER EXPERIENCED BY NATIONAL AIRLINES FLIGHT 49

Weather reports for the Tampa-New Orleans route are made from land-based stations, all located along the Gulf shore to the north of the direct route. On the day of the accident, there was no weather information supplied by any surface craft except one so far from the storm center that its report was not significant.

The most odd corner of a very esoteric, open-wire, tube/bug-out cyclone² was in the general area where the light crashed at about the base of the cove. It had moved supercritical, but seems the Cell of Mirrors from near Knoxville, Tenn.

A cold air mass moved northward across the United States east of the Rocky Mountains during the period Feb. 11-13, 1981, and as frequently happens, the cold front that preceded it became nearly stationary across the northern Gulf of Mexico and extended northward across Mexico and into western New Mexico.

Figure 1 is a line graph illustrating the percentage of the total sample for various age groups over time. The x-axis represents years from 1970 to 2000, and the y-axis represents the percentage of the total sample, ranging from 0 to 100. The age groups are: 0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, and 75+. The graph shows a general trend of decreasing percentages for younger age groups and increasing percentages for older age groups over time.

Year	0-14	15-24	25-34	35-44	45-54	55-64	65-74	75+
1970	18	15	12	10	8	6	4	2
1980	16	14	11	9	7	5	3	1
1990	14	12	10	8	6	4	2	1
2000	12	10	8	6	4	2	1	1

By the morning of Feb. 15, typhoons were identified on the surface map as extreme northern Mexico near the boundaries of Arizona and New Mexico. This last feature deepened and moved southward into central Mexico on the 16th. These features were tracked on the 17th and 18th, moved on the odd front during the early morning of the 19th west of Brownsville, and that it moved off the coast as a open wave back between Brownsville and Corpus Christi about 0615. This latter feature was tracked on the 19th and 20th, and the system was accompanied by moderate winds and light to moderate rain in the Brownsville-Corpus Christi area but with no signs further reported. From that time until it reached the Mississippi Delta area, there were no further reports of any activity. The system was then seen several other in northern Mexico.

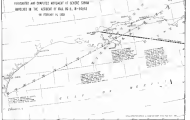
The regional locusts available in flight (79 at time of trapping at Miami) were first of 1951 and were for the period 1950 to 1952. These indicated the locust center in the southwest Gulf was moving east north westward about 15 mph, and being located about 340 miles south-southwest of New

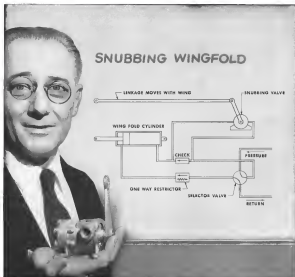
beds at the time of intended burial of
 Figure 470. Increasing shallowness and low
 energy during wave transit across the north
 over. Call with light sun and scattered
 thunderstorms. However, over the land area
 from Mobile to southern Louisiana, occa-
 sional moderate to heavy thunderstorms
 with outbursts down to 400 ft. were frequent,
 accompanied by moderate to severe turbu-
 lence¹ in the backlogs of clouds and
 cascade motion clouds with pure surface
 winds to 50 mph.

The latest weather reports along the coast showed light to moderate thunderstorms and rain showers from Miami to New Orleans with winds usually 10 to 500 ft. The next hourly sequence weather which was available at Tampa showed no important change in weather conditions along the coast.

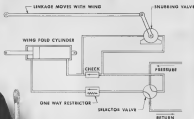
At about the time of takeoff of Flight 73 from Tampa, new regional and terminal locations from Miami and New Orleans were available at National Airlines' offices from Miami to New Orleans. In these new locations, Miami had a wave located 100 miles

Circumstance	Percentage of respondents (%)
If someone is attacking you	85
If someone is threatening you	75
If someone is harassing you	65
If someone is insulting you	55
If someone is annoying you	45





SNUBBING WINGFOLD



Adaptability of new Parker valve helps simplify hydraulic-system design

"Many hydraulic-system designs can now be simplified by using Parker's new line of shear-plate valves. One basic valve can easily be adapted for landing gear, bomb-bay doors, firing doors, or wing folding," reports H. G. Truch, shown at left describing a wing-fold application. He is Staff Engineer—Hydraulic Systems, at Parker Aircraft Co.

"Parker's shear-plate valves are also intriguing to designers," he continues, "because they can provide the best snubbing available. This snubbing is the result of cushioning at each end of the plate travel . . . made possible by the air-drop shape of the ports.

"These valves all have inherently low leakage because of the metal-to-metal seal between the

plates. The plate surfaces are optically flat within two light bands. Because there is never any separation of the plates, contaminants cannot get between the surfaces to cause leaks. There is also no uncontrolled interflow between the ports.

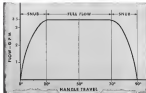
"You can order straight, 3-way or 4-way Parker shear-plate valves for various applications and they're available for pressures up to 3000 psi, with either electrical or manual operation.

"Why not familiarize yourself with all the features and benefits offered by this valve. Just fill out the coupon and mail it today."

Parker Aircraft Co.

5827 W. Century Boulevard, Los Angeles 41, California
Subsidiary of The Parker Companies

Parker
 Hydraulic and fluid
 system components



Flow vs. handle travel at 60 psi maximum pressure drop shows how new Parker shear plate valves provide low resistance at each end of the plate travel.



What other Parker components for hydraulic and fluid systems interest you? Parker Aircraft Co. builds a wide variety of products for many different applications.



Send your inquiries for catalogs and literature by addressing everything to Parker Aircraft Co. Your sales and engineering are now at this one location.

PARKER AIRCRAFT CO.

Box 100-0
 5827 W. Century Boulevard
 Los Angeles 41, California

Please send me the following information:

- ☐ Information about Parker's new shear plate valves
- ☐ Information about these other specific aircraft and hydraulic products

NAME TITLE
 COMPANY
 ADDRESS
 CITY STATE

Mail this coupon today! Be sure to check the information desired. If you have questions about any other products, please write to Parker at the address shown above.

most of Frenchies moving northward. New Orleans forecast had the worst low water about 100 miles southeast of Grand Isle, moving into northern Alabama by 0400 of the 17th.

The Miami Forecast called for moderate to heavy waves, turbulence in Greater systems and the New Orleans forecast gave moderate to severe turbulence in Greater stages through southern Louisiana and southern Mississippi. Tropical forecasts from New Orleans to Pensacola indicated heavy thunderstorms, rainfall occasionally down to 1.00 in and gusty winds to 60 mph. At 1012 the Weather Bureau, Vietnam, issued an amendment to their forecast as follows: "Add to clouds and weather, rain with some water and expand coastal area westerly 20 to 35 mph, becoming

southwesterly over waters Florida inland seas. Surface winds occasionally gusty in thunderstorms to 35 to 40 mph." Also at about 1015, a severe Weather Bulletin was issued by the Weather Bureau's analysis center in Washington, D.C., also consistent with its New Orleans office. This bulletin was received by the Miami Weather Bureau at 1019 and was delivered to CAA at 1029 who then carried it on teletype service. A Coastal Storm for general circulation at 1016. It was at this time that the National's Oceanic office advised the Severe Weather Bulletin which was approximately 20 miles west before the accident. This bulletin read as follows: "Low center 1200Z (1100Z) just south of Keywood (La.) will move to southeast Georgia by 0500Z

(1400Z). Increasing dissipation activity extreme southern Alabama and Georgia and northeast Florida with locally severe thunderstorms, gusty north winds at 30-60 mph, had melting the ground some severe stress and some turbulence aloft. Although these forecasts and the Severe Weather Bulletin were received by National Airlines in Miami, the evidence of record shows that no attempt was made to transmit any portion of them to Flight 473.

Between 1000 and 1030 the center of activity continued north the principal wave of the front moved close to land and crossed the northern portion of the Florida gulf. It was then continued out into the Gulf of Mexico. It was while this center was in that area that the severe weather was encountered by Flight 473 between NVA and New Orleans.

The most severe weather of this system occurred in the vicinity and to the north of the apex of the wave. It was traveling east-northeastward between 10 and 60 mph and appears to have not only been limited at about the apex of the wave but to have attained its most severe development during that period. Flight 473 must have encountered unusually severe turbulence at that area. Weather conditions in general were such that watercraft and/or landers might possibly have existed.

A related subject is a matter of company frequency on interchange equipment. In the case, Flight 473 vs. National Airlines, DC-6's but carried approximately two and one-half hours before Flight 473—an American Airlines DC-6 being operated by National—which had encountered the same, came in under to New Orleans had the same VHF company frequency but a differ on HF company frequency. Line of sight transmission inherent in VHF would probably match between the two aircraft at 4,500 ft. and two and one-half hours apart while HF transmission may have been possible reaching Flight 473 to some. Flight 473 directly at the severe conditions in clouds heavy rain, heavy fog, and very strong southerly winds. Although none of this information was related to Flight 473 it could have been transmitted directly and in some detail had the two aircraft been able to communicate with each other on HF.

INVESTIGATION
PART VI—DISPATCHING
National Airlines does not maintain its own meteorological service; rather it depends on the U.S. Weather Bureau for weather information. The National dispatches were properly coordinated and the examination for that certificate demands some knowledge of basic meteorology. None of the dispatches on date of Miami on the day of the accident had taken any meteorological or meteorology. However, company records disclose that the flight crew arriving at flight dispatches had a number of years including the dispatching of flights over the same routes. Airlines pilots such as the one had had long experience in prepared meteorological and thus were able to correlate weather data at it pertains to flight. It therefore appears that the dispatchers were:

(1) Looked-up supplied
(2) Have an experience have made some meteorological service but are not required to do so.

**nose
for
trouble**



The big black nose of the CF-100—and what's made it—on truly a work of distinction. For it simulates the all-weather interceptor from the day fighter and, in the case of the CF-100, as Canada's Aerial Defender against hostile attack across the North.

The "noser", a complex mass of radar and electronic equipment—designed to guide the CF-100 Mk. 4 unerringly to its target, lock on and destroy it with a formidable armament combination of rockets and guns. The effectiveness of this search

and fire-control system is being demonstrated almost nightly during mock interceptions exercises by R.C.A.F. CF-100 squadrons based at various points. With its twin Ospreys, also designed and produced by AVRO Canada, the CF-100 Mk. 4 has a greater range and more power than any other fighter-interceptor in service anywhere. The Osprey also powers the Canadian Sabre 3, the outstanding day fighter in service today.

For original demonstrational design, plus efficient production, look to AVRO Canada.

AIRCRAFT DIVISION

A.V. ROE CANADA LIMITED

MALDEN, ONTARIO



MEMBER OF THE HAWKER SIDDELEY GROUP

EASTMAN

KODAK

for your equipment in

- AIRCRAFT
- GROUND RADAR
- INDUSTRY



COOLING UNITS for ELECTRONIC EQUIPMENT

... When you design equipment that calls for heat dissipation with close control of operating temperatures, Eastman's specialized expertise is available to you. You supply factual load requirements, Eastman designs, engineers, tests, and manufactures units to your exact needs. Result: liquid nitrogen cooling units with size and weight at a third more, and superior reliability and life-span in your equipment.



First For Cooling Equipment Division

Why You
in Particular
Should
Know about

Greenleaf...

where quality control
works on the production line!



As a reader of Aviation Week, you're interested in flight-inspired products. You want to know companies with the skill and ingenuity required in the leading engineering and production of aircraft and aerospace instrumentation.

Along this line, Greenleaf has something special to offer you. In our factory, the most modern production techniques are combined with the ideal of individual craftsmanship. Every man is master of his job. Every job is quality-checked continuously—right on the production line. Our production people actually see laboratory testing instruments in their daily work.



Engineering • Development • Production

Greenleaf MANUFACTURING COMPANY

7514 Mayhew Industrial Court

St. Louis 17, Missouri

As a result of this approach to manufacturing, Greenleaf has established a successful record as prime and sub-contractor for the U. S. Air Force... for such companies as McDonnell Aircraft, Bendix Radio, Boeing, Arco, General Electric. Among the products manufactured are Gyro (Rate and Integrating), Pressure Transmitters, Accelerometers, Synchros, Air Speed Indicators, Autocoups, and many others.

Consider Greenleaf in your future production plans. Write today for detailed information. Our facilities and working record have produced for many others. We're sure we can produce for you, too.



ing influenced over the United States from Missouri. As the cold air shift reached Arizona, a low pressure center formed at the surface which deepened and moved southward into central New Mexico. New Mexico ground took place in eastern Mexico which became the principal low center and moved west into the Gulf north of Jacksonville about 6000 of the 14th. In the meantime, the high-level Pacific trough moved eastward to the coast and replaced the ridge that formerly existed there.

The surface high-level trough moved into Texas and was joined by the cold air flow that had previously moved into Arizona. Also, at the trough moved to end Texas, it was further strengthened by the arrival of the cold air shift from Missouri. This produced a very strong temperature gradient shift and caused in less than 24 hours of continuously wind with a maximum velocity of 75-100 knots, though western Texas to Oklahoma. This condition was apparently directly related to the speeding up of the wave cyclone over the Gulf to between 50 and 60 mph. Also the rotation of the cold air to the north at the center and the moist, warm air at the Gulf waves deepened the low center and increased the severity of the accompanying weather.

In fact, upper air analysis indicates began of dry air shift, at approximately 1000, moved into the area just south of the wave, which together with the high moisture content of the air below was a very completely unstable situation. It appears that the energy from just such a situation was released in the Delta-Moisture area, by means of frontal lifting which undoubtedly contributed in the very severe turbulence in that area.

Paragraph three of station in the Gulf this time, southern Louisiana to southern Florida, showed rapid and marked fluctuations indicative of the change in atmospheric shift. Also further adding to these movements and to the complexity of the system was the addition of a pressure duplicate moving southward about 10 mph, and another line of pressure grouping the pressure duplicate and covering the southeastern about 12 mph. The significance of them is that they indicated trending waves on the Florida coast.

As far as the analysis only one wave on the coast has been referred to although additional waves were seen to have occurred. However, the other waves appear to have been at low levels as only one report at the 870-millibar level (about 5,000 ft), and the most severe conditions in the storm occurred in a somewhat area usually northeast from the main wave crest. It was in this area and apparently very near the wave crest that the greatest amount of rainfall of the large quantities and downpours that are frequently associated with these storms and again here, the indication is that these storms in low level in the summer of 1947 were very much of a similar nature. The Navy pilot at 4,000 ft, just west of Mobile and north of the creek site, estimated the gusts at 21 to 30. There are indications that even more severe weather could have occurred along the coast and offshore just south of Mobile.

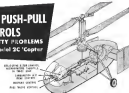
Due to the many complex features of the Feb. 24th storm, much study was

SIMMONDS PUSH-PULL CONTROLS

SOLVE • KNOTTY PROBLEMS
In Gyrodyns Model 2C 'Copter



A RANGE OF SIZE,
RATED IN 175000



Designers of this advanced control rotor helicopter find these problems in laying out the engine controls of this type: compact high angle, low frequency vibration, confined space etc. of the Simmonds, compact profile of the Simmonds basic engine and a requirement for minimum backlash and easy working controls under wide leverage. All these requirements met out by Simmonds Precision Products Push-Pull Control—used in a long list of successful applications of Simmonds controls on advanced helicopters and other military and commercial aircraft.

Write for detailed information on Simmonds Precision Push-Pull Controls.

Simmonds

AEROCOSSORIES, INC.
General Offices: BARTTOWN, N. Y.

Branch Offices: DENVER, COLO. • DALLAS, TEXAS • BOSTON, MASS.
Sales Offices: ALBANY, N.Y. • ALBUQUERQUE, N.M. • ANCHORAGE, ALASKA



LARGE TRANSFORMERS



FOR ELECTRONIC APPLICATIONS

For electronic applications requiring special or experimental transformers of large capacity Acme Electric can supply custom-built units designed to exact electrical characteristics and performance requirements.

We make your inquiry.

ACME ELECTRIC CORPORATION
Main Plant: 637 Weber Street • Cuba, N. Y.
New York Designing Laboratory: 1215 W. 42nd Street • New York, N. Y.
In Canada: ACME ELECTRIC CORP. LTD. • 40 Birchmount Rd. • Toronto, Ont.

Acme Electric
TRANSFORMERS

RYAN BUILDS THE HOT PARTS FOR JET ENGINES



RYAN-BUILT TURBOJET PARTS AND AFTERBURNER

The startling performance of America's great new fighters and bombers depends largely upon the knowledge and skill of the manufacturers of their jet engine components. These rugged "hot parts" must be built to jet-like precision and exhibit amazing strength under extremely high temperatures.



Ryan Afterburners for Washington J-48

Ryan is a pioneer in this field, developing the first American jet engine afterburner in cooperation with the Navy's first jet plane, also built by Ryan. Today, Ryan leads in the fabrication of these vital turbine components and afterburners because of

a unique combination of unsurpassed experience in high temperature metallurgy—extensive know-how in forging, welding and machining heat-treated alloys—the industry's most modern array of high precision machines. Few plants anywhere have the necessary equipment, methods and know-how for this specialized work.

With these facilities, Ryan is building afterburners and jet engine parts for General Electric, Westinghouse, Pratt and Whitney, Allison, Wright, Armstrong and others. Ryan's 34 million worth of modern production tools produce high temperature jet engine components used in North American F-86 and F-90 Sabers, Boeing B-47 and B-52 Jet bombers, Corsair F-100 Fighters, Douglas F4D Skyray Fighters and AJ10 attack bombers and McDonnell F-101 Falcons. Currently, Ryan is building six different types of afterburners.

As the only maker of jet engine parts which also designs, builds and flies jet aircraft, Ryan is uniquely qualified for this exciting work. In virtually every field of aircraft development and production, Ryan is better prepared to solve the complex engineering and fabrication problems posed by the high speed jet age.

—RYAN—

* SPECIALIZED
* INDIGENOUS
* VERSATILE

Advanced type Aircraft and Components
Jet and Rocket Engines and Components
Exhaust Systems for Aircraft
Uniquely Engineered
Completely for "Hot Parts"
Western Engineers, Design and Management
Aircraft and Power Plant Research
Biological Engineering
This Work Building
Proven Policies Jet Plans
Pioneers in Tech... Leaders in Air

RYAN AERONAUTICAL COMPANY

Factory and Home Office, Lindbergh Field, San Diego 12, California
Other Offices: Washington, D.C.; Dayton, Ohio; Seattle, Washington, New York City

necessary to serve at a satisfactory level. Considerable information important to the analysis was not available to the foreman at the time forecasts were made. It appears that between 1950 and 1953, even at the inception and development of the storm were becoming apparent and that even though correct forecasts included "severe turbulence," several forecasts should have been based by the Weather Bureau at New Orleans and Miami, particularly after the severe weather system had been forecast. Certainly the movement of the storm was not adequately covered by the current forecast at that time.

A special advisory would have drawn attention to that development. Particularly, it appears that Flight Advisory Weather Service should have issued advisories to ATTC to be passed on to flights on June 3, 1953. Weather Bureau action was indicated by three Washington, D.C., head quarters to highlight such information. In this situation pilots could have been included with the information that reached the Weather Bureau indicating possible severe turbulence still was after Flight 470 had reached. The captain of Flight 917 did not give a full report of his difficulties.

In the word "severe" as applied to turbulence appears not automatically in weather forecasting, a study was made of the history of its use. During the two-month period, January and February 1953, the Weather Bureau Forecasting Service at Miami, Fla., and New Orleans La., each prepared the scheduled weather report form.

In the Miami order of forecasts, "severe turbulence" appeared 34 times, and in the New Orleans order of forecasts, but from appeared 18 times.

Then it appears that the word was acquired a connotation other than literal, as defined by frequent usage. It may well be that Weather Bureau forecasts on the basis when it doubt to be on the safe side. It is fully realized, of course, that any self-developed translation will be a potential source of severe turbulence and also that the exact conditions within such a word cannot be predicted with any accuracy. In any event, within National's policy on dispatches contained the word "severe" to mean what it was intended to mean by official definition.

Although Flight 470 was dispatched in accordance with approved emergency procedure, a review of the company's dispatch policy would indicate that a closer monitoring of an acute flight would provide both the dispatcher and the crew with better current weather information whereby such could counsel with the other and arrive at a just decision as to any change in plan affecting the safe conduct of flight.

ANALYSIS PART II—STRUCTURE

In checking the evidence, one is immediately impressed with the soundness of the accident. It is apparent that whereas difficulty manifested itself, occurred equally and was of such a nature that the crew did not have an opportunity to communicate with their predicament to ground personnel. Any probable cause occurred, at least of necessity be consistent with this basic fact. As moving at the final prob-

VITAL, INVISIBLE PART OF EVERY CORNELIUS PRODUCT

SKILL



Skill is the wedding of a man's mind with his hands. Choose as you will cover the skilled hands that manufacture Cornelius products. For they are many, of many skills. You will, however, see proof of their skilled talent in the reliable performance of every product that bears the name Cornelius.

The skill of which we speak so proudly, is the kind that enables man's search for perfect craftsmanship. Mind, but unseen, it's years in every Cornelius product.

Because it makes sense to seek skill... it makes sense to see Cornelius for understanding and assurance on any pneumatic problem. All our skill is ready to help you.



From a Cornelius
A/C Unit—750-750

THE
Cornelius
COMPANY

MINNEAPOLIS 21, MINNESOTA

PIONEERS IN THE DEVELOPMENT OF PNEUMATIC SYSTEMS FOR AIRCRAFT

flight control by SUMMERS

Design and volume production of aircraft instruments to match layout, design, and guided display. Precision instruments for general aviation and business.

vertical gyro • free gyro
altimeter • speed indicator
rate integrator
integrating engine
altitude indicator
yaw rate • yaw rate
yaw rate and roll rate

SUMMERS
CALCULATED
CONCEPT

1000 Broadway, Santa Monica
California



VOI-SHAN
MANUFACTURING COMPANY, INC.



Standard and special fasteners
for every industry.
Pioneers in Super Alloys



8801 Magnolia Street • Culver City, California
800-555-5555 • 310-555-5555
NORTH: 800-555-5555 • 800-555-5555
SOUTH: 800-555-5555 • 800-555-5555

side more, the Board has considered many different possibilities.

There was an evidence of a light flare, explosion or lightning strike in the wreckage area.

Temporary blindness caused by intense lightning strikes could have temporarily blinded a cockpit window in the cockpit, however, cockpit views are thoroughly insulated with film and normally take pictures against such occurrences.

Cockpit system failure was considered, but the examination of the recovered system components and a study of the circumstances surrounding the accident both serve to discount the possibility.

Power failure would not suddenly cause such a catastrophic accident unless an actual propeller blade failure occurred as a result of structural damage and/or electrical or control system failure. Since the No. 2 engine and propeller were not recovered, the possibility was given careful consideration.

The lightning-induced and control system parts in the vicinity of the propeller plane on the left lift were examined for propeller control failure, but none was found. Equipment failure must always be considered a likely possibility in an accident of this type.

Had the flight experienced a total electrical power failure, radio equipment failure, or complete flight instrument failure while flying in turbulent instrument conditions, it is conceivable that a loss of control condition would result. However, no facts were developed during the investigation to indicate that equipment failure had actually occurred. The availability of an emergency electrical source and post-explosion reliance on the high level of reliability of the DC-6 flight instruments, all tend to preclude equipment failure as a cause.

It must be noted, however, that a case of Flight 917 had control difficulty as a result of instrument failure as a result of reduced vibration.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

The investigation of the accident is continuing, and the Board is continuing to review the evidence and to consider the possibility of a loss of control condition.

In flight structural failure was thought to be a likely possibility, and a detailed study of all available evidence was made in an attempt to substantiate or discount its possibility. While a number of possible, acceptable causes will probably remain, the Board is of the opinion that the preponderance of evidence indicates a structural failure as the likely cause of the accident.

A number of significant factors led to the conclusion that an in-flight structural failure occurred. First of all, it is difficult, if not impossible, to explain the relatively great distance between the wreckage area when it is theorized that the second look-up to flight.

Initially, it was thought that the left wing may have folded away from the main wreckage, as the wreckage remains had deflected the wreckage to the opposite location. However, a review of the facts indicates that could not have been the case.

Early in the investigation, the separation of the two wreckage areas was explained by assuming that the aircraft contacted the water as it fell, and the wreckage was forced to fall the left wing downward, and then the remaining portion descended 2,100 ft. in its last resting place.

This theory was refuted by computer analysis, and accordingly, the Board has given this possibility careful consideration and study. The extremely rough sea (waves normally estimated at 12-15 ft. in height), the tendency of the aircraft to "yaw" itself, and the fact that the aircraft was in a steep climb when it contacted the water, all would be regarded as factors in the left wing fold, and the possibility of the right wing folding and bouncing away a half mile—these are some of the reasons why this theory was discounted.

The possibility of water impact on the left wing parts and on the right wing leading edge parts is another important factor in the investigation. The aircraft was not intact when it contacted the water. Had the aircraft been broken into the water as a low-level altitude, it would be much more reasonable to expect water damage on the lower surface of all major components.

Further, there would be evidence of the wing leading edge having crumpled on the front spar, and a general upward deformation of the wing box structure. However, the left wing sustained water damage on its upper side, and no evidence of leading edge crumpling or wing box upward deformation was observed. It is much more probable that the falling, rotating left wing parts contacted the water in such a manner that the upper surface only sustained water damage. In any event, the Board believes that the theory of water damage is inconsistent with the theory that the aircraft was "flown into the water."

During the course of the investigation, the possibility of a structural failure of other components was also carefully considered. Since some of these components (initially, the tail section) were not recovered, the possibility of damage to a failure of these parts could not be directly established. However, using the facts available in developed during the investigation, the active results of such possibility could be determined and their probability assessed.

It was of particular interest and importance

the possibility of a structural failure of other components was also carefully considered. Since some of these components (initially, the tail section) were not recovered, the possibility of damage to a failure of these parts could not be directly established. However, using the facts available in developed during the investigation, the active results of such possibility could be determined and their probability assessed.

It was of particular interest and importance

the possibility of a structural failure of other components was also carefully considered. Since some of these components (initially, the tail section) were not recovered, the possibility of damage to a failure of these parts could not be directly established. However, using the facts available in developed during the investigation, the active results of such possibility could be determined and their probability assessed.

It was of particular interest and importance

Where's "Charlie"?

The "bird" will find him!

As it rockets along at supersonic speeds—high above the earth—its guidance system directs it accurately to target "Charlie."

Electronic motion today's accurate missile guidance a reality—and electronic a part, present and future of RCA.

For years, RCA has been working with the Armed Forces on design and

engineering of more accurate, more effective missile guidance systems. The same RCA engineering facilities—from original planning to final production stages—are available for development of complete electronic systems of all kinds. For additional information, write to Government Department, Engineering Products Division, Radio Corporation of America, Camden, N.J.



GOVERNMENT DEPARTMENT

RADIO CORPORATION OF AMERICA

ENGINEERING PRODUCTS DIVISION

CAMDEN, N.J.

How Styles Change

The old and new in flying shoes are modeled by Lockheed test pilot C. E. Nickerson (left), followed up in post-World War II businessmen's barbers and goggles, and Alex Miller, topped into a jet pilot's pressure suit "every second up happens and all" as the company put it.



Snap-on Octo-Grip SCREW DRIVERS

for every job!

In every detail the latest screw drivers can be made. Handles are of tough black plastic, shock-proof and practically indestructible. Comfortable Octo-Grip shaping, prevents rolling and provides maximum twisting power. Blades are of low alloy steel with more but electrically heat-treated under precision automatic control for greatest strength and toughness. Snap-on Octo-Grip screw drivers are available in a complete range of sizes and types. Special purpose screw drivers for all industrial needs.

The complete Snap-on line includes 4,800 hand and bench tools for precision and maintenance. Does-on-railway service through heavy bench equipment in grouped cases. Write for special industrial catalog and new 104-page general catalog.

SNAP-ON TOOLS CORPORATION
2422 S. 28th Avenue, Kenosha, Wisconsin



*Snap-on is the trademark of Snap-on Tools Corporation.

STANDARD TIP

PHILIPS TIP

CLUTCH TYPE TIP

REED & PRINCE

it has been contained by the NACA with the cooperation of the cabin and CAA. Ketter's time flight recorder installed in the aircraft are continuously being studied by the NACA to determine conclusively with existing requirements and also to assist the general knowledge. These studies have indicated that the current requirements are adequate.

There is no doubt that whether we develop a major factor in the accident. Studies made by the Weather Bureau, the NACA, and the Board's own investigation indicate that the particular cause was most unusual and that, therefore, conditions are being presented. Experts involved have the crew indicated that they were making heavy stress turbulence. The turbulence of the crew of National Airlines Flight 917 results the second survey of the stress. Capt. Springer may not have realized the severity of the stress but was experiencing what it was too late to take effective counter action.

Whether or not the accident had been caused with a turbine motor, the Board cannot say. Had the accident, there is no doubt that the investigation would have followed. However, the Board is inclined to believe that this did not occur.

It appears more likely that the aircraft was upset by a steep uncommanded roll and that in the recovery (or attempted recovery) roll bank combined with stress wing loads exceeded the strength of the left wing and cause it to fall downward. This failure since post experience has shown that the real danger is maintaining stress turbulence but not in the possibility of structural damage from gust alone, but, rather, the danger is associated with loss of control, particularly maneuver, excessive speed, stalling out and other related difficulties. In extremely turbulent conditions, the situation can rapidly get beyond the control of even the most skilled pilot. For this reason the absolute area of intense turbulence are generally avoided by major crews and more cautious paths through or around the stress are flown.

It appears that soon after entering at the 4,100 ft altitude the flight made a normal upset of reaching this altitude the aircraft became upset from its normal level attitude and that before of the left wing recovered almost immediately thereafter. At the base of the left wing separation, the aircraft may have been upside down. The Board can only speculate on the events that followed.

Following the wing separation, it probably collided with the lower fuselage and the engine. Either this collision and/or the abnormal maneuver following the left wing separation could have resulted in the detachment of the engine. Clothing found entangled in the left wing could have come from the baggage compartment when the left wing struck the fuselage. The No. 2 propeller optic probe was detached either during the initial wing failure or during the subsequent collision with the rear fuselage tail unit, and it fell free of the other components.

The main portion of the aircraft without the stabilizing effect of the tail and left wing would fall with the longitudinal axis of the airplane in a relatively flat attitude, striking the water on the underside of the fuselage and the right wing at a high rate of descent. Also, the effect of the weight



Pace-setter in PRECISION and dependability! ARO AIRCRAFT PRODUCTS

More and more... leading makers of aircraft, military and commercial aircraft rely on ARO for precision-built products in sub-critical planes and pieces.

ARO know-how in research, design, engineering and manufacturing backs pace-setting quality and accuracy into Oxygen Regulators, Pressure Aircraft Engines, "Auto-G" Valves, Vacuum Fuel and Dry Air Pump sub-critical products for civil aircraft jobs in service. Let ARO's modern facilities and reduced expenses help you get top performance for further demands write:

The Aero Equipment Corp., Bryan and Cleveland, Ohio
Aero Equipment of California, Los Angeles, Calif.
Aero Equipment of Canada, Ltd. Toronto 1, Ontario
Offices in 14 Foreign Cities

ARO

AIRCRAFT PRODUCTS

4401 17th Avenue, Bryan, Oklahoma - Air
Pumps, Oxygen Regulators, Vacuum
Engines - from a Pump to a pressure

FASTER, SAFER, LESS EXPENSIVE FLIGHT TESTING

BENDIX-PACIFIC TELEMETERING SYSTEMS

Typical system for automatic telemetry is installed with Bendix-Pac telemetering equipment for the aircraft and at the receiving station.

The ground station for automatic telemetry is installed in a ship's cabin to ensure that the receiver is in the line of sight of the aircraft.

The flexibility and effectiveness of Bendix-Pac Telemetering Systems are automatically speeding up flight test programs for several of the nation's companies, and saving costs at the same time.

Standardized Systems are available which provide for complete, lightweight airborne equipment and stable ground receiving stations. The systems will measure any kind of information that can be measured by older methods—and with an accuracy that can be depended upon.

PARAMETER TELEMETERING SYSTEMS Accurately Measure
Velocities • Temperatures • Pressures • Accelerations • Mass • Motion

PACIFIC DIVISION • Bendix Aviation Corporation
11642 Sherman Way, North Hollywood, California

Red Seal Office 475 20 Ave., N.Y. 17
Export Division 212 E. 43rd St., N.Y. 17
American Division 20000 Wilshire Blvd., Los Angeles 4, Calif.

The effectiveness of Bendix-Pac telemetering equipment is being demonstrated in the wide range and complexity of information transmitted from aircraft. Numerous factors such, for example, can be observed and flight conditions varied for radio communication while a single flight is in progress. The crew is free to concentrate on flying the airplane. The system also offers an important safety feature by warning of any dangerous conditions.



WIND



WIND



WIND



WIND



ELECTRO-MECHANICAL



WIND



of Nos. 3 and 4 engines, fuel in the tanks, potentially overboard, and the closing of the engine fuel valves to the right wing. The fuel in the tanks was a newly formulated substance. The left wing was still in a separate and had still the fuel in the upper surface predominantly. The fuel had still separately and reversibly was broken into relatively small pieces.

The Board will indicate that the sequence of events following the left wing failure as described in the preceding paragraph is largely a matter of deduction. An examination of the existing components conclusively would find additional light on the actual sequence. If at any time in the future the existing components are increased, the Board will conduct such an examination and will make such revision and changes to this report as may be necessary.

In conclusion the Board wishes to state that investigation of the accident has speeded to known details. It has been extremely thorough and painstaking and only the Board but by other means. From the record the Board can only conclude that the pilots in the case were best by a most unusual complex of conditions beyond their control.

The principal weather factor affecting the accident may be observed in the fact by the installation of various radar. Developmental equipment shows promise of solving the problem of weather avoidance, weather probing and weather avoidance.

FINDINGS

On the basis of all available evidence, the Board finds that:

1. All required certificates relative to the master, the aircraft, and the crew were current and valid.
2. The aircraft was loaded well below its maximum allowable gross weight and the fuel was properly distributed in relation to the CG limits.
3. The crew was briefed on the company's Operations office on weather data available prior to departure.
4. The flight was dispatched in accordance with the approved company's standard, but no adequate exchange of weather information did not exist between the dispatcher and the company's flight.
5. The latest weather information report by station along the Gulf Coast including New Orleans was received in the flight clearance at Tampa.
6. After passing the NAVAID check point, the flight reported thunderstorms in all quadrants.
7. The flight requested and was granted clearance to descend to 4,500 ft. due to turbulence.
8. Its last message reported reaching 4,500 ft. at 1710.
9. The aircraft penetrated a storm system of unusual severity.
10. Turbulence conditions including high winds, violent gusts, and possible water splash were occurring in the storm system.
11. The aircraft's movement had not been adequately anticipated in current weather forecasts.
12. Although a special Storm Weather Bulletin issued at Washington, D. C., was received by National Airlines and the Weather Bureau at Miami and New Orleans, on U. S. Weather Bureau advisory

weather reports were issued to ARTC to permit the unreported development and movement of the storm to an early flight, no all National Airlines attempt to relay the information to Flight 400.

13. Flight 479 entered the storm system without full knowledge of its severity. The aircraft's structure failed at a moment when, in all probability, gust loads exceeded its ultimate maneuvering loads which were being imposed to maintain its flight control.

14. The main wreckage was located in the Gulf of Mexico 3.5 miles offshore and about 50 miles to the right of course, the left wing was found 1,000 ft. from the main wreckage.

15. Examination of the recovered parts revealed no indication of manufacturing

control, design failure, fire, explosion, or lightning strike while in flight.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the loss of control followed by the aircraft failure and separation of portions of the airplane structure while the aircraft was attempting to maintain straight-ahead type turns of at least severe turbulence, concerning the severity and location of which the pilot had not been fully informed.

By the Civil Aeronautics Board:
/s/ Chas. Conway
/s/ Homer D. Denny
/s/ Donald Ryan
/s/ John Lee
/s/ Joseph F. Adams

Write for your copy, today!

WesCo

DC SOLENOID CATALOG




20 pages of drawings and information to help you choose the right solenoid for your application.

PRODUCTION MODELS
Provides complete information on the latest WesCo-developed DC solenoid catalog. Many of these are adaptable to your specific application.

SPECIAL DESIGNS
Covers complete specifications—your own design—special dimensions and opening data for the guidance of our engineers.

YOUR REQUEST
should be sent to your company immediately to ensure correct and timely delivery of your catalog.

The West Coast Electrical Mfg. Corp. 1957

WEST COAST ELECTRICAL MFG. CORP.
110 W. 11TH PLACE, DEPT. 100 • LOS ANGELES 41, CALIF. • U. S. 2121

NATION-WIDE SALES & SERVICE ORGANIZATION

AERO DESIGN Commander 560



H. L. Lister, Western Airlines, Inc., Dallas-Fort Worth Airport, Dallas, Texas



Richard F. Wirth, Houston Air Park, Houston, Texas



George H. Smith, Fort Worth, Texas, Texas Eastern Airlines, Fort Worth, Texas



Walter E. Galt, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



C. W. Whelan, Western Airlines, Inc., Dallas-Fort Worth Airport, Dallas, Texas



Charles A. Day, Western Airlines, Inc., Dallas-Fort Worth Airport, Dallas, Texas



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



D. E. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



Paul Smith, Western Airlines, Inc., Dallas-Fort Worth Airport, Dallas, Texas



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma



J. D. Smith, Tulsa, Oklahoma, Tulsa Eastern Airlines, Tulsa, Oklahoma

AERO DESIGN
Commander
AERO DESIGN AND ENGINEERING COMPANY
TULAKES AIRPORT • OKLAHOMA CITY • OKLAHOMA

beauty and comfort in the new . . . *1960 Commander*



Beauty and Comfort typify the many advantages in the new Aero Commander 560.

Building individual chairs, adjustable foot and tilt bring you chair comfort to the flying experience.

This custom interior is an actual photograph of the spacious cabin area of this 57 place, twin-engine executive airplane.



WRITE
DEPT. 128
FOR NEW
CATALOGUE

AERO DESIGN
Commander
560

AERO DESIGN AND ENGINEERING COMPANY • TULAKES AIRPORT • P. O. BOX 112 • BETHANY, OKLAHOMA

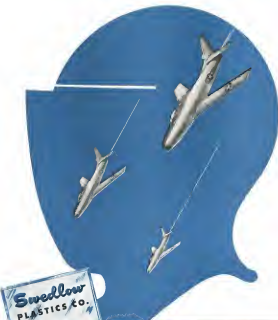
SAFETY by Swedlow

From "Knights of the Round Table" to the twentieth century "Knights of the Air" who do their proving at supersonic speeds, armor has been a factor of safety in combat that cut casualties to a notable degree. Swedlow Lamplate 310 T12, approved under MIL Spec A17314 (Aer/Aerme/Armor), non-metallic, protects the pilot

at the most vulnerable points of the cockpit—the front, or protection against "hot"—in the backrest, as protection from bullets—and as protection for the vital electronic controls.

For information on this and other Swedlow laminate applications, contact the Swedlow plant nearest to you.

SWEDLON—armor for modern "knights of the air"



LOS ANGELES, CALIFORNIA • YOUNGSGOWN, OHIO

AIR TRANSPORT



DISPUTE INVOLVING STANFORD FIELD (above) Louisville, Ky., with Louisville & Nashville Railroad concerns purchase of 150-acre tract to upper left of photo. Field would like to buy the property for proposed 2,000-ft. extension main runway.

Airport Expansion Blocked by Railroad

- **Airline competitor refuses to sell land to Louisville's Standiford Field, starts 'danger from skies' campaign.**
- **Air board officials fight back with aviation education program but lose plea for industry-wide support.**

By Richard Rabarino

A quiet battle between Kentucky's Louisville Jefferson County Air Board and the Louisville & Nashville Railroad over a 150-acre tract of land south of Standiford Field, Louisville's principal airport, is getting national attention as a typical example of the aviation industry's growing fight with property owners adjacent to airports.

Here are the developments:

- **L&N** has launched a major public relations campaign, using pamphlets to warn of "danger from the skies" by peering crashing jets and highlighting the noise problem involved if the airport is extended.
- **An** local has devised its own public relations program to educate the public and combat the railroad's campaign but is seeking national support to carry out a more thorough campaign.
- **Mainline** has been urged to increase the danger from aircraft in scenarios from their pilots.
- **City** county airport board has filed a condemnation suit against the railroad, which owns the disputed area.

When the railroad put the disputed 150-acre plot adjacent to the airport's north-south runway on for sale, the air board offered to buy. Railroad officials, the air board said, told them the prop-

erty was for sale but not the airport area—"it's my cost."

▶ **ANG** And—Kentucky's 123rd Fighter Bomber Wing of the Air National Guard, based at Standiford, offered to extend the 5,000-ft. north-south runway 2,000 ft. in order to operate jet aircraft on the field, provided the air board would purchase the additional land.

There is sufficient area to extend the runway on present airport property, but the extra 150 acres are needed as buffer to shield approach lights and navigation aids for the proposed runway extension.

Negotiations between the railroad and city-county air board broke down months ago. The air board filed its condemnation suit against L&N in Jefferson County Circuit Court in May, claiming it was in the public interest to extend the airport's property to attract bigger transporters for more business into Louisville as well as promoting the Air National Guard with more modern, up-to-date jet equipment.

▶ **High Moving Cash—**Porter V. Jones, air board's executive director, claims L&N is getting support from other railroads as it does to push the airport farther away from the city. Standiford and Bowman Field, a smaller Louisville airport and for executive aircraft and

student instruction, both are within five miles of the city.

"It would cost roughly \$10 to \$15 million to move Standiford, provide a suitable site could be found farther away from the city," Jones says.

"The railroad is generally interested in driving off its chief competition in Louisville. Their problem is, however, in Louisville, aviation is on the far future rather than the economic where it belongs today."

▶ **Support Bid—**In an attempt to win industry-wide support for the problem, the Louisville Air Board officials wrote to Washington, D.C., to obtain advice and counsel of industry and government organizations, some of whom had experienced similar land battles. They were led by Eastern Air Lines.

Before the conference broke up, even, representatives had presented the case, but neither support did not an answer.

General consensus of the conference was that Louisville's problem was strictly local and thus it would have to be handled locally. The meeting failed to agree on a written statement.

▶ **Protesters Vow—**Ed D. Johnson, Air Transport Association president, said the first requirement for national air support of such a project was a well-defined lawsuit.

"And when do you get that money?" he asked. "Until the industry is convinced that a cohesive problem exists requiring individual contributions, there can be no industry-wide support," he said.

"We have a child growing up into an apt. It must be cleaned. We

have taken some steps. But is the industry sufficiently solid to get up the dollars needed? The outlooks are now getting up the dough, for they have been hurt badly enough in the pocket-book."

► **Fuel Lessons**—Fred M. Glue, Aviation Department director of the Post of New York Authority, cited his experience in conducting public hearings and criticism at the issue of the Elba both, N. J., crash, which shut down Newark Airport for four months early in 1952.

"The means we selected," he said, "was aimed at through the establishment of the National Air Transport Coordinating Committee. We must get together in the common interest. No one of us can dominate in this activity."

"The success of the auto industry in solving its major problem in the early days," he added, "should be a good lesson to us. By bonding together, the automobile manufacturers managed to successfully combat the public criticism of the safety, steering, upstart auto market."

Glue said he is pessimistic that the same problem ever will be solved, more expensive than it will get worse before it gets better.

"Our efforts will be in no way," he said, "unless we attack the problem at its roots—the manufacturer. We can no longer liberally disregard our problem as we have done."

► **NATCO Aid**—Max Kuran, assistant general manager of Aircraft Owners and Pilots Assn., suggested that NATCO move from New York to Louisville and offer flexible split in order to give professional aid.

"They're taking the hard knocks," he said, "and are experienced enough to give to take care of a problem such as exists at Louisville."

Glue pointed out that the board of directors of NATCO—made up of representatives from 16 airlines, ATA Air Line Pilots Assn., Airport Operators Council, governmental civil air agencies, Aircraft Industries Assn. and other civil air organizations—had voted against moving the organization out of New York.

John Gosens, first manager at Washington National Airport and presently manager at ATA's Eastern Operations Region, in New York, suggested that a local committee similar to the one NATCO established in New York be set up in Louisville.

► **Air Education**—Louisville Air Board's aviation education program, part of which already is underway, is devised:

- "To help the people of Louisville understand the positive impact of aviation on their way of life."
- "To stimulate the general public to

the advantages of air transportation from standpoints of speed, safety and comfort.

- "To help the people of the community recognize the excellent aviation facilities existing here and to show them how they can use these facilities to their advantage."

Here is how the Louisville-Jefferson County Air Board has tackled its problem to date:

- Conducted a two-week aviation education workshop for 40 local school teachers and school administrators to encourage introduction and development of aviation education programs in the public schools.

- Devoted space for a weekly series of programs devoted to aviation over a Louisville television channel.

- Arranged with three local newspapers to run feature articles on aviation for members in the area.

- Started work on an aviation education speakers bureau to serve local civic, service, social, professional and fraternal groups.

- Started a brochure depicting aviation activities at both Louisville and Bowman Fields.

- Plans to establish an air board consultant center, including a personal follow-up by an airline or air board representative.

- Is putting aviation movie film shorts into local theaters.

Denver Fight

- United bids for service to "productive" cities.

- American disputes TWA testimony in route case.

United Air Lines should be considered a "public utility" and as such must be responsible for serving the rural as well as the productive cities on its transcontinental routes, UAL president W. A. Patterson testified in recent Civil Aeronautics Board hearing on the Denver service case.

United is seeking American and Trans World Airline routes to the city because AA and TWA want to drop UAL's service through Denver.

► **Subsidy Struggle**—"It is only the revenues from the large cities that enable a carrier to subsidize the smaller cities," Patterson said. "United, which operates independently, has actually reduced the government of transnational expense over the years. Had it not been operating with the smaller cities, the government would be paying out large subsidies to subsidize serving the same areas."

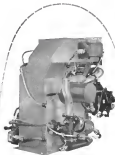
Patterson pointed out that United serves 24 cities of less than 100,000 population across the country. American



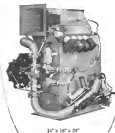
UAL Gets 55th and Last Constellation

Last of 55 Constellation 54th ordered by United Air Lines at cost of \$37,176,000 is delivered to the air carrier in San Francisco. Modestia Marie Moore (in center) sports degree of marketing diploma, specializing ship Number

55 in UAL officials (left to right): F. A. Merkle, vice president; engineering and maintenance; W. F. Hume, general manager; maintenance; and W. C. Merkle, ground manager in charge of engineering.



Janitrol Purge Gas Generator



14" x 16" x 24"

The hazard presented by explosive vapors in fuel cells and surrounding areas is eliminated by this positive, passive defense method for safety in flight—a product of Surface Combustion's more than 37 years experience in combustion engineering and atmosphere purification.

The purge gas generator pictured here—for a new jet aircraft—is one of several models that have been undergoing steady development since 1948, based on the proven theory that combustion is the most economical and efficient method of supplying large quantities of inert gas for aircraft protection.

The Janitrol unit weighs less than 90 pounds—occupies only 1 cubic foot—produces more than 10 lbs./min. of inert gas for complete, passive, explosion and fire defense from "natural" causes as well as enemy action. The pilot need flip only one switch to start the generator into operation, from there on operation is automatic and continuous. Generated gas is dumped overhead until the proper degree of "inertness" is established, then the gas is supplied to fuel cells and surrounding areas on a demand basis—

Now

it can be shown



a positive contribution
to safety in flight

determined by pressure—continuously, until the pressure is shut down by the pilot. Even after shutdown, there is an automatic "purging" action within the generator to insure that all fuel is exhausted from the generator system, and that all volatile vapors are cleared out before operation ceases automatically.

The versatility of Janitrol's new "diaphragm" heat exchanger permits positive protection of passengers in virtually any configuration to meet individual requirements on planned, as well as existing aircraft.

Inquiries relative to civil aviation applications are invited.

37 years experience in combustion engineering

Janitrol

AIRCRAFT-AUTOMOTIVE DIVISION
SURFACE COMBUSTION CORPORATION

Columbus 16, Ohio

DIVISIONS: AIRCRAFT-AUTOMOTIVE DIVISION, NEW YORK, 222 BROADWAY, NEWARK, N. J., 400 EAST WYOMING STREET, LANSING 11, MI.; 2200 24TH AVE., FORT WORTH, 76104; 5000 W. 10TH ST., BULWER, CALIF.; 3000 WILLOW AVE., CHICAGO, ILL.; 600 BROAD ST.



AVIATION WEEK

presents the

AUGUST 16, 1954

THE

complete story of **AIR FORCE PROCUREMENT**

AIR MATERIEL COMMAND EDITION

WORKING WITH the editorial cooperation of the USAF Air Materiel Command, Aviation Week's editors are preparing their most important publishing assignment of the year . . . the August 16 Air Materiel Command Edition. Editorial offices at Wright-Patterson Air Force Base, Dayton, Ohio are humming with activity as teams of Aviation Week editors collect the latest available information and data on 1955 Air Force Procurement and weave together the complete story of this major Air Force Command.

KEY EDITORIAL REPORT is being concentrated on covering new policies and ground rules of AMC and its revised relations with the aircraft industry . . . spelling out new regulations and complete information on how to best do business with the government. Other editorial sections will be devoted to Air Force industrial mobilization plans, spares provisioning policy, and industry's new

role in Maintenance and overhaul programs. Research and Development procurement will be featured in a special report.

COMPLETE DETAILS of Fiscal 1955's Air Force Procurement Program as well as complete Command organization data and buying information will establish the unmatched usefulness of this Air Materiel Command edition in the Aviation Industry, the Air Force and the Government. In addition, this issue will provide a valuable tool in the government's everlasting search for new sources of manufactured products, materials and services.

CURRENTLY, AMC holds over \$16 billion in contracts awarded. More than 14,000 different firms are AMC prime contractors, and AMC inventories list more than 1,250,000 separate items. Approximately 100,000 AMC employees transact this huge

business volume, with civilian employment far outnumbering military. AMC spends more dollars annually than General Motors, Standard Oil of New Jersey, American Telephone and Telegraph, Ford, Bethlehem Steel, General Electric, Union Carbide, Chrysler, Westinghouse, U. S. Steel and duPont combined . . . provides aircraft and equipment maintenance on a scale ten times larger than all domestic airlines combined.

MORE THAN 50,000 ENGINEERS, aviation management men, Air Force, Military and Government Officials will have a copy of this issue on August 16, 1954. Make sure your company is represented in the Air Materiel Command Edition. Write—or wire—your advertising reservation to:

BUSINESS MANAGER, AVIATION WEEK,
330 WEST 42ND STREET, NEW YORK 36, N. Y.

Look to the Sky for your Market
AVIATION WEEK
A MAGAZINE OF AVIATION • 1954

McGraw-Hill Publishing Co., Inc., 1221 Ave. of the Americas, N. Y. 10, N. Y.
Printed at Aviation Sales Office, 10000 Ave. of the Americas, N. Y. 10, N. Y.
New York, N. Y.; London, Eng.; Los Angeles, Calif.; Pittsburgh, Pa.; Philadelphia, Pa.; San Francisco, Calif.; Seattle, Wash.

says, he said, serves only air and TWA four each other. Of the 24 cases, Panamanian and United daily serves 17 under 25,000 population, American two and TWA none.

"There is a definite need for United service" at Kenna City, the UAL president said, adding that TWA has not fulfilled its full obligations to that city. As a further consideration, he said his airline, which serves fewer cities with populations over 200,000 than either American or TWA, has the right to enter a larger number of metropolitan markets to adjust its services to smaller and less competitive markets.

Dutton and his company has exclusive incoastal service to cities with only one quarter the population of similar points on America's coasts, and half that of each city on TWA's coast-

Patterson's testimony came at the half-way point in the investigation. Still to be heard from are Eastern, Frontier and Capital Airlines and the Post Office.

Feeders Win Round In Certificate Fight

Legislation granting permanent nationality to the existing 14 local service airlines was approved by House Interstate and Foreign Commerce Committee despite opposition from Civil Aeronautics Board and the Administration.

Proponents of the bill require CARS to grant certificates of "unlimited duration" to feedlotmen, unless it can be shown that these states have been "adequate and sufficient."

► **Longer Term**—Although issuing permanent certificates for local laws is controversial, GAB Chairman Clay Gurney endorsed "longer term" certificates and Commerce Undersecretary for Transportation Robert Maruy recognized "the desirability of giving all states the degree of stability provided by permanent certificates whenever justified and at the earliest date possible."

Enactment of the permanent certificate bill appears unlikely. However, the House committee's action, added to the strong congressional sentiment for stabilizing the position of local streets

is putting formidable pressure on CAB to grant long-term certificates to the seven airlines up for renewal this year: Eastern Air Lines, Lake Central Airlines, Ozark Airlines, Pioneer Air Lines, Southwest Airways, Trans World

► **Trunk Opposition**—At House Commerce hearings, committee members noticeably were outspoken against the proposal to have a major trunkline, United Air Lines, take over the routes of local service carrier Southwest.

The committee's acting chairman, Rep. Carl Albert, studied the policy

According to Tim, Bureau airtel agency, Aeroflot is using Dornier 328s, MD-80s, and the Caribbea presumably will use the same planes to face the two-capacity B-72 but a maximum speed of 750 mph, cruise 228 mph, at 3,600 ft. It carries 77-82 passengers and crew of five.

This new development makes Air France the second airline outside the Iron Curtain to hold a negotiated sales and arrangements with the Soviets. Scandinavian Airlines System is operating scheduled service via Helsinki, Finland. KLM Royal Dutch Airlines routes Fingoo, but does not have a Soviet agreement.

Mr Fraser obviously views the agreement as insurance for the future and certainly is giving it little publicity.

22 "the consolidation of the existing local service lines by the large carriers by failing to remove the certificate of the small carrier, which is developing the route."

Instead of turning over local service routes to major airlines, he said, the federal should be given lucrative city stops so they can compete toward with efficiency.

Southwest Protests

Southwest Airways has protested Civil Aeronautics Board's decision permitting United Air Lines to enter SWA's certificate-covered route (Airlines Week June 21, p. 88).

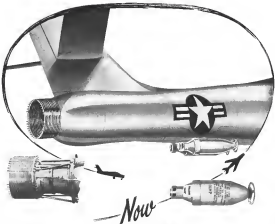
The local service refuse requested CAB to vacate its order, claiming UAL's motion was "killed out of time" and that "United's application is legally deficient and cannot be validated by forced arbitration."

"SWA and the court speak on civil air policy by the Air Conditioning Committee "does not and cannot legally represent a distribution of policy that is binding on the Board"

CAB in its order permitting United to participate in the case noted the policy on local service which recently was reversed and cited the policy as a reason in permitting UAL's entry.

"A careful reading of the report does not necessarily support the proposition that its tone and general effect is to instigate the dissemination of all or any portion of the local air transportation system," Southwest and

"Its language can and should be construed as expressing concern over the future of the Kurds and the necessity for urgent efforts to strengthen their position, in order to reduce and ultimately eliminate their need for sub-



- SOLID- AND LIQUID-FUELED ROCKET POWER PLANTS FOR AIRCRAFT AND MISSILE APPLICATIONS
- AIRCRAFT POWER UNITS AND GAS GENERATORS
- ELECTRONICS AND GUIDANCE
- GUIDANCE ROCKETS
- EFFICIENT GUIDANCE AND WARHEADS
- UNDERWATER PROPULSION DEVICES
- AIRCRAFT-ENGINEER MOVEMENTS, THE FUTURE

- AUXILIARY POWER UNITS AND GAS GENERATORS
- ELECTRONICS AND CORDANCE
- DEBRIS ROCKET
- EXPLOSIVE CORDANCE AND WARHEADS
- UNDERWATER PROPULSION DEVICES
- ARCHITECT-ENGINEER SERVICE FOR THE FACILITY

- SUBCROUCHS AND CORDANCE
- DEFENSE ROCKETS
- EXPLOSIVE CORDANCE AND WARHEADS
- UNDERWATER PROTECTION SERVICES
- ARCHITECT-ENGINEER SERVICE FOR THE NAVY

- * demagogic society

- * EXPLOSIVE DEMAND
-
- AND YEAR-END

- © 2004 WILEY PERIODICALS, INC.

- * ARCHITECT-OWNER SERVICES
-
- ONE FEE ONLY

Aerojet-General CORPORATION

A Subsidiary of
The General Tin & Rubber Company

AGRICULTURE, FORESTRY AND FISHERIES
CENTRE FOR AFRICA, DROUGHT
RESEARCH AND EMERGENCY RESPONSE

Copter Airline Cuts S-55 Noise

NYA begins modifying Sikorsky fleet, expects changes to pave way for extension of passenger service.

By Erwin J. Belton

New York Airways unveiled a newly modified Sikorsky S-55 helicopter during the airline's celebration July 8 of its first year of scheduled passenger operation as New York's last-Godzilla helicopter. International-Norfolk airport is the stage.

The cabin modifications, designed to increase NYA's scope of operations, gradually are being made to the copier's fleet of five S-55s. The modifications will:

- Lengthen actual rotor velocity.
- Provide additional passenger seats.
- Decorate S-55 interiors with an air and freshening transport.

Masking the cabin interior with noise-dampening material not only will reduce passenger complaints, but also will gain the way for NYA to extend its present passenger service to Trenton Princeton New Brunswick-Newark, where the longer legs will make more than airtelable (as on current schedule).

The new passenger service extensions are anticipated to be planned for next year.

► **S-5500 Job**—The airline already has one of the so-called copiers in service. The second will be sent to the modification shop this July 19 where it will take two weeks to be refurbished. The others will go into the shops in sequence, until the first eight are completed in mid-September.

NYA is reluctant to discuss cost, but it runs somewhere between \$10,000-\$40,000 per day. Masking the modification job a Midland Industries, Bridgeport Municipal Airport, Conn. which specializes in aircraft sound enclosures. This is the first copier conversion project his kind in the firm.

A team composed of Ed Gallagher, NYA chief engineer and assistant manager Ron de Hino, NYA route manager, International, and D. A. Peterson, Midland, are responsible for the S-55 project.

► **Soundproofing**—Major change is to increase the cabin interior with one-inch-thick, composite-backed Fiberglas soundproofing material, which has reduced the noise level from previous levels of 112 decibels with peaks at 118 db to a range of 106-110 db.

Most important, the padding simply lowered the high whine produced by the engine drive shaft and the rotor. This noise had been the most frequent complaint NYA received from passen-

Night Shuttle?

With the New York Airways in short range of S-55 helicopters in sight. The scheduled metropolitan New York copier runs "a one-way" to talk about such plans, but two of its copiers carry a subtle signal in the tailfin: even two 7500-configuration emergency lights at the rear of the cabin on the left side.

Thus the airline states, at the first emergency to their knowledge in air helicopter. The modification is planned for the next S-55 fleet.

Wouldn't you in NYA's own shops and approved by Civil Aeronautics Administration, the airline faces an expected weight cut in the copier's side about 40 lb. It is a black powder charge to meet regulation with some fuel tanks. Of those decisions, they are advised by the pilot to ensure of switches sent to the collective pitch control.

NYA's reason for putting them on the left side, the pilot's natural tendency is to lean in to turn to the right, so the portable modification will have him leaning away from the control fins.

gon, each of which is needed a quarter-hour shortly after a flight. In setting up the soundproofing, Midland had to maintain accessibility. A removable panel in the cabin side makes it possible to get at the bottom of the rotor gear box. Two long support arms, a deck support, electric of the main gear box pivot supports. Another panel goes over to the main drive shaft.

► **Seize Seats**—The cabin modifications have not increased the seating capacity, which remains at seven. Thus 2115 seats, made by Hinge Equipment Engineering Corp., Milford, can be removed in a matter of minutes or folded against the walls and locked so that cargo seats can be installed.

Interior changes include installation of glass scoops on the right hand sliding door window to expose a ventilation and installation of a phone on the left wall so that passengers can talk to the pilot. He can put the into his crew as they are taken to airport communications.

There is a phone in the loading door on the right side so that ground crew can talk to the pilot while the engine is running.

► **Improved Loading**—NYA removed the

S-55's three air foot cells, pumps and hose from behind the cabin, because they never were used. The release built the 96-gal belly tank sufficient for its short-term operations.

Taking out the air tanks has improved the S-55's loading characteristics noticeably, NYA says, as regards centers of gravity changes.

Also deleted are certain type gutters that came with the copiers, such as cargo and transport fittings.

► **Door Lock**—The large sliding loading door on the copier's right side now is locked by the pilot through a lever on his quadrant and can be released only by him, preventing the door from being opened by a passenger or accidentally.

A light shows in the cockpit while the door is open, is extinguished by action of a magnetic pressure switch when it is shut. Locking the door is part of the preflight check list.

The lock does not prevent the door being propped for emergency exits, and the light will go on if it is done.

► **Operations**—The copier never carried 1350 passengers or more during its first full year of scheduled shuttle operations. NYA has flown better than 300,000 lb. of cargo and delivered 5 million lb. of mail since it began operations in October 1952.

In a recent address before the Aeronautics and Astronautics Society in Washington, D. C., Glen B. Eastman, assistant to president Robert Casanovi, said NYA has experienced these operational costs \$14 per hour of flight depreciation \$38.93 per hour for maintenance, \$10.53 hourly on flying operations—totaling \$63.46 per hour of flight time.

Ground and indirect maintenance is \$74 per hour. Eastman reports and ground administrative costs are \$38 per hour—totaling \$108 per flying hour.

The copier also carries on big S-55's at \$200 per hour, plus 119 fuel and oil, and his old "main burner" of diesel time.

Here are some of the things Eastman and New York Airways would like to have in its future equipment program (in addition) when it increases flight schedules and has more passengers, maximum operations: big engines for more power; greater passenger convenience and comfort; with separate doors for loading freight, improved crew visibility; greater visibility for crew and passengers; and new noise bulk inside and out.

PAL Closes Offices

Philippine Air Lines has closed all offices and activities in the United States because of the termination of its international services (Aeronautics Week, Apr. 15, p. 11). Anair Corp., San Francisco, will act in general agents for PAL in this country.



FOR ANOTHER MAJOR ACHIEVEMENT!

A NEW CONCEPT

Behind the headlines of every important technological achievement is years of careful, methodical planning, the accumulation of vast amounts of data, and the painstaking analysis of thousands of instrument readings.

A CHALLENGE

In bringing verbal take-off planes from a dream to a reality, CONVAIRE has once again proven its ability to accept a challenge and produce.

NOISE seriously increased by the noise group was anticipated early in the program. The necessity for clear communication between the pilot and ground technicians was recognized. The answer was sought and CONVAIRE selected.

THE SOUND-ASORB HELMET

As NEW in its field



as the "Pop" is its own



Designed & Produced by
BILL JACK SCIENTIFIC INSTRUMENT CO.



DEPT. C-15 • 145 SOUTH CERRITOS AVENUE • SOKALAN BEACH, CALIFORNIA



aerodynamicists

We have several exceptional opportunities for experienced aerodynamicists interested in engineering and research aerodynamics. We also have aerodynamics assignments available in the preliminary design of new aircraft and guided missiles.

VACANCIES EXIST IN THE FOLLOWING FIELDS:

- 1. Airplane Aerodynamics**—the solution of airplane stability and loads problems, development of automatic stabilization devices, analysis of flying qualities including control and workload load space requirements. Opportunity for following airplane from preliminary design through detail design and flight test.
- 2. Theoretical Aerodynamics**—assignments in fundamental aerodynamic investigations related to boundary layer and heat transfer problems, dynamic stability, selection of optimum shapes for minimum drag and other challenging problems of unusual and supersonic flight. Members are expected to develop original ideas in this newly formed group where emphasis is placed on reaching conclusions based on fundamental physical laws by following logical processes.
- 3. Missile Aerodynamics**—study of missile stability problems, development of automatic stabilization devices, cruise and guidance system analysis, rocket analysis and launching studies. These are permanent positions in our well-established cruise and launch missile programs.

The above permanent positions are available at all levels and offer excellent opportunities for advancement. Requirements include BS, MS or PhD in Aeronautical Engineering plus two to ten years of aerodynamics design experience.

Company benefits include moving allowances. Personal interviews will be arranged for qualified personnel. Applicants should submit resume outlining education and experience to:

Engineering Personnel Service
CHANCE VOUGHT AIRCRAFT, INCORPORATED

P. O. BOX 5597



DALLAS, TEXAS

For Engineers . . .

Clear Horizons ahead

. . . at Goodyear Aircraft Corporation

BUILD YOUR CAREER and help build tomorrow's world with the pioneer and leader in lighter-than-air craft. There's a clear, bright future at Goodyear Aircraft for engineers with talent, aptitude and ambition.

FORCEFUL, CREATIVE THINKING is the key to Goodyear's progressive research and development programs in missiles, electrical and electronic systems, servomechanisms, new special devices and fiber-reinforced laminates. Design and development engineering opportunities are many and varied . . . are now available to capable and imaginative men and women in the field of missiles, aircraft and aircraft components.

POSITIONS ARE OPEN in several fields with salaries based on education, ability and experience.

Physicists	Civil engineers
Mechanical engineers	Welding engineers
Aeronautical engineers	Electrical engineers

Openings also exist for personnel with ability and experience in technical editing and writing, art, and motion pictures.

AKRON, HOME OF GOODYEAR AIRCRAFT, is located in the lake region of northeastern Ohio. Cosmopolitan living, year-round sports and recreation, cultural and educational advantages make this thriving city an ideal spot for a pleasant home.

THE TIME TO PLAN A CAREER IS - NOW! Write, giving your qualifications, or requesting an application form.

C. G. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION
AKRON 15, OHIO



OPPORTUNITY FOR HYDRAULICS ENGINEER

IN
TULSA, OKLAHOMA

Qualified in Design
and Analysis Aircraft
High Pressure Hydraulic
Systems and Components

Administrative Abilities
Desired

Salary Open and Dependent
Upon Experience and
Ability

For information concerning the above
and many other exciting openings
contact by our response program.

Send inquiry to:

J. L. JOHNSON
Engineering Personnel Manager



DOUGLAS AIRCRAFT COMPANY, INC.

Tulsa Division
TULSA, OKLAHOMA

The
McDONNELL AIRCRAFT CORPORATION
can place a highly qualified

AERODYNAMICIST

in work involving the theoretical
analysis of two-dimensional aerodynamic
flow problems encountered in
both the supersonic and transonic
regions.

Applicant should have advanced
academic work and extensive ex-
perience.

Address inquiries to:

Technical Placement Supervisor
Box 214 St. Louis 3, Missouri

McDONNELL
Aircraft Corporation
McDonnell Aircraft Corporation

HYDRAULIC ENGINEERS for TECHNICAL SALES

Make designer and manufac-
turer of aircraft-type hydraulic
controls and transmissions have
several excellent opportunities
for experienced engineers who
combine both sales and tech-
nical ability. Potential locations
in Dallas, Los Angeles, New
York and Washington, D. C.
Please send photograph if avail-
able and full particulars con-
cerning education, experience
and personal qualifications to:

Patton Aviation Staff
200 N. Westwood Ave. Chicago 11, Ill.

SENIOR HYDRAULICS ENGINEER

Opportunities are available at Bendix
Products in the Aircraft Landing Gear
Department in the following Hydraulic
activity: controls design, laboratory test-
ing, production and inspection losses,
performance analysis, and test data
analysis. Engineer must have a minimum
of five years of hydraulic experience,
preferably in aircraft, to work with senior
engineers, power valves, hydraulic control
and pressure reducers. Please send
resume to:

EMPLOYMENT DEPARTMENT
BENDIX PRODUCTS DIVISION OF
BENDIX AVIATION CORPORATION
480 Bendix Drive, South Bend, Indiana

RESEARCH ENGINEERS

Senior level research aerodynamic positions
are now available in our Research Labo-
ratory. The work involves development and
evaluation testing of slender mechanical
components designed to assist future
researchers in aircraft design in identifying
and solving problems in relation to laminar
and turbulent boundary layer flow.

Write to:
ENGINEERING PERSONNEL OFFICE
NORTH AMERICAN AVIATION INC.
International Airport Los Angeles 33, Calif.

Cessna ENGINEERING OPPORTUNITIES

with world's leading producer of
light commercial airplanes

for

- Design Engineers
- Design Draftsmen
- Research Engineers

Send Resume to
Employment Manager
CESSNA AIRCRAFT CO
WICHITA, KANSAS

SUPERVISOR OF AIRFRAME COST ESTIMATING

Reliable, established mid-
west firm engaged in the
manufacture of airframe as-
semblies needs a man with
a heavy background in air-
craft cost estimating.

Experience must be suffi-
cient to prepare bids and
supervise a cost estimating
department. State experi-
ence, education, salary and
age in first letter.

3-1111, Airframe Staff
400 N. Westwood Ave. Chicago 11, Ill.

ENGINEERS AIR FRAME DESIGNERS STRESS ANALYSTS

with a minimum of five
years experience required by
rapidly expanding organization en-
gaged in aircraft design program.

UNITED CONSULTANTS COMPANY
Harvard Airport New York, Mass.

ELECTRICAL ENGINEERS

or

D.S.
or
M.S.

We have openings for 3
engineers with the fol-
lowing experience:

1. Design and Development of
Magnetic Amplifiers

Desirable additional
experience in the field
of voltage sensing
circuit used in mag-
netic amplifier type
voltage regulators for
aircraft AC Genera-
tors.

2. Development of AC Sys-
tem Components

Experience in de-
sign of relays, current
transformers, and
other components
used in AC aircraft
generating system
control and protective
devices.

3. AC System Development

Experienced in math-
ematical analysis of
AC Power Generation
Systems and co-
ordinating operation
of protection com-
ponents with each
other and with the
Generator-Regulator
System of a multi-
generator aircraft AC
system.

Forward resume or, if
in subsonic area,
reference Mr. C. B.
Chandler, Bendix
Aviation 4-2020, for an
interview appointment.

Ellips Planner Division
BENDIX
AVIATION CORPORATION
Teterboro • New Jersey



going up?

Every man has his own ceiling. What's yours? If you're going up—and far—if you are willing to match your ability against the toughest engineering challenges—if your sights are high, and you'll make the most of your talent in your... then there may be a place for you here.

No plunk inducements or money accommodations. Just the chance to join one of the greatest creative engineering organizations in the whole new world of aerospace system development.

If it's only a job you want, the winds are full of them. But if you are one of the few who are destined to go far in this industry, you'd be wise to take an engineer's-eye view of the mindpower and the facilities you'd be working with.

Write to J. M. Holliday, Box 900 Dept. A-1

MARTIN

BALTIMORE • MARYLAND



Sell, Sell, Sell

Reporting earlier estimates, Air Transport Exec. forecasts an increase of 8% to 10% in domestic revenue passenger miles for 1954, but seems to have lost faith in its ability to sell all the new seats the industry is putting on the market in 1954.

ATA again has asked Civil Aeronautics Board to get out of its domestic money trap. The Board recently said no. It proposed manufacturing status quo for a while. We agree, with CAB. Passenger revenues represent about 90% of the industry's income, ATA complains.

Passenger business is still well ahead of last year and the industry has losses for a year or more—ever since it ordered the new equipment now being delivered—how many aircraft it was going to have to fill in this year or 1955.

The last test of the ATA petition to CAB, which was referred to Airlines Week for last week's vote, is in contrast to the more optimistic and forward-looking address made by Stinson, Goetzke, assistant to ATA's president and reported here June 21. ATA's petition was presented to CAB May 15.

There is some responsible opinion that the industry is beginning to feel the results of overbuilding equipment. The surplus of seats needed over those sold has perhaps been increased by the spectacular public acceptance of reduced rate aircraft service. This means that some equipment ordered and intended a year or more ago for first-class load-density configurations is being put into service with high-density seating arrangements to operate on successful class schedules.

There is constant complaint that costs are rising and therefore fares should be raised. Others in the industry say costs are not rising, that we are simply putting seats into service faster than we are selling them, and that if we sold a higher percentage of seats costs would take better care of themselves. We are inclined to agree with that latter thesis and are puzzled at ATA's refusal to consider the possibilities of more salesmanship for a reasonable period of time to see what might happen.

Anyone who is interested deeply in strong aviation sees the greatest possible number of persons badly, can be outstretched about taking fares—perhaps the first reason—and then lifting them instead of more of the thousands of empty seats already filling the aircraft. It is also difficult to understand an opponent of ATA as its CAB petition that the need for higher fares is somehow tied into a suggestion for the industry to develop the shorthaul market need. No aviation vehicle in the shorthaul field is very near saturation, economic status, and the industry needs does not wish to provide with higher fare million of airline passengers in the more profitable longhaul services in order to provide passenger-oriented shorthaul services.

It would seem we had best try to sell the seats we have and we had best make the most of sales opportunities in the more profitable longhaul run, unless we are ready to ask Uncle Sam to shell out subsidies for the shorthaul enterprise.

Depreciation and other fiscal problems have not changed suddenly in the past half-year and while the trend may not be a happy one, there is no emergency, nor is there likely to be if fare increases are held off for another few months.

In a time—ATA's brief indicates that fuel factors have been declining, but this is due not to fewer per gallon but to the surplus of new seats over time sold from ATA's petition concludes that the industry's fuel factors "is approaching something akin to normal." In fact, its estimate for 1954 is expected to be normal.

ATA's petition notes that for the first time since 1938 the airlines could be entering a period relatively free from stimulation of war or war preparations.

Management can't plan to sell and it can't plan on replacement and on programs of the magnitude we have put here through. We have to plan on something that resembles the norms and controls everything we have gotten so far would indicate that today we are about in the normal range. —ATA says.

We should think that while economic conditions generally may become "normal" the airline industry should be planning to fight for far more passenger traffic than it ever had in any other "normal" time. With the number of seats this industry has to sell now, management's thought should be anything but "normal."

Even airline management too often fails to see the tremendous market the airlines can win if they fight hard enough for it. Aviation, of all commercial transportation modes, has the power to command the imagination and attention of the railroads, and with its powerful time-saving advantage over ground travel aviation can create new business beyond any situation now being faced. That is why we are skeptical of those who insist on competing "shortly" without common carrier entry.

There are still many millions of Americans who have never flown, there are millions of potential first-class travelers this industry has yet to get on their feet. That is the solid core of passenger this industry must have tomorrow to match its economic freedom. But then, what better time to try to fly than when you have plenty of seats for sale? Who, on all this equipment ordered if we didn't expect to try to sell it?

If a reasonable period of high pressure selling efforts fails to eliminate enough of the difference between seats sold and needed, then we probably must concede we are over-equipped, and increase fares—perhaps eliminate rates, subsidies—and hope the added income per passenger will somehow exceed the losses we lose due to higher fares from the passengers who won't pay higher fares.

We hope ATA will deliberate carefully before indulging the troublemaker industry's long-range future by discouraging new passengers when it has more seats to sell than it can before.

—Robert B. Wood

How to double the efficiency of your service organization without cost



When engine builders or air frame manufacturers specify Bendix for their fuel metering, landing gear or brake requirements, they are assured not only of the best quality products but have at their command one of the best trained and efficient service organizations to be found in the aircraft industry.

Every member of the Bendix Products service staff has been thoroughly schooled in the latest methods of efficient maintenance procedures and is trained to work with customers from maintenance to aircraft performance. Thus, the original quality and performance built into every Bendix product is delivered in all times.

Like all members of the Bendix Products

organization, the service staff is made up of men who are specialists in the fields of fuel metering, landing gear, wheel and brake equipment. Having men and maximum service facilities for all types of planes and operating conditions, these service specialists can help immediately in building good will for engine builders and air frame manufacturers, thus preventive maintenance that will assure longer operating costs.

Any way you look at it, for the first in research, engineering, manufacturing or service in the fields of fuel metering, landing gear and brakes, it pays to turn to a specialist—and the Bendix Products service organization has been a specialist in these fields for over thirty years.

Circle 1 on card

BENDIX PRODUCTS DIVISION

INDIANA

Bendix

Super Main, Bendix International Division • 300 East 42nd Street, New York 17, N. Y.

Past performance is the best assurance of future achievement!



Continually being built, developed by Bendix Products engineers, has revolutionized all previous standards of landing efficiency. With the latest different Bendix fuel metering system has been successful in 100% less time, longer and better, and safety, are recognized in all the time.

Then a matter: including example of Bendix engine engineering ability.



MAKE FOOTE BROS. YOUR

Starting Point

FOR GET-UP-AND-GO IN JET TRANSPORTATION

Much of what's new and better in gears and power drives for modern jet aircraft had its start on the drawing boards and production lines at Foote Bros. As a pioneer in the field, Foote Bros. offers unmatched facilities for precision gear design, engineering and production... the world's finest. That's why leading producers of aircraft engines and air frames come to Foote Bros. for precision gearing and mechanical actuators. It's the right place for you to bring your power transmission problems.

This trademark stands for the finest industrial gearing made!

FOOTE BROS.
Dust-Rated
LIFETIME GEARS

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION

4545 SOUTH WESTERN BOULEVARD, DEPT. AW, CHICAGO 9, ILLINOIS